METR - M00732

NEI

CE25
series

C28F2TXZ
C25F2TXZ

COLOUR TV
SERVICE MANUAL

CONTENTS

SECTION

1. Specifications and Basic Operation
2. Description and Options
3. Safety and Servicing Precautions
4. Adjustments and Alignment
5. Main chassis - PSU and Deflection
6. Main chassis - Vision and Colour Decoder
7. Main chassis - Sound IF and Audio
8. Main chassis - Tuning and Control
9. Main chassis - Teletext
10. NICAM Decoder
11. Zweiton Decoder
12. System L/L' Converter
13. CRT Convergence
14. Circuit Diagrams and Component Layouts*
15. Parts Lists*
16. Cabinet and Miscellaneous Parts*

** Loose inserts*

Section 1 - Specifications and Basic Operation

SPECIFICATIONS

Power Supply:	220 - 240V AC, 50Hz 140 - 264V AC	Nominal Maximum
Power Consumption:	85W 130W 15W	Normal levels Maximum Standby
System Standard:	PAL, SECAM, (CCIR, OIRT) See options table	
Sound Standard:	FM Mono B/G/H, D/K, I * NICAM B/G, I * ZWEITON B/G, I	
Tuning Range:	* VHF I 51-143MHz Ch E2-E4 Europe Ch S1 Cable Ch A-C Ireland Ch 2-4 B-D France * VHF III 150-466MHz Ch E5-E12 Europe Ch S2-S41 Cable Ch D-K Ireland Ch 6-10 E-Q France UHF 474-858MHz Ch 21-69	

Antenna:	75 Ohm co-axial
Picture Tube:	PIL 110 degrees 25" (59cm) to 28" (66cm)
Audio Output:	2 x 8W RMS at 10% THD (6-8 Ohm load) * Internal speakers: 2 x 10W music power
Teletext:	* Fastext (English, German, Swedish) * Toptext (German) * X26 (Spanish, Turkish)
AV1 (VCR):	Video (FBAS) out - clear/descrambled S-VHS Luma and chroma Video (FBAS) in Audio out (stereo for NICAM or ZWEITON decoder) Audio in - stereo
AV2 (DECODER):	Video (FBAS) out - clear/scrambled Video (FBAS) in Audio out (mono or scrambled) Audio in (stereo) RGB and blanking in

** Options*

BASIC OPERATION

A comprehensive On-Screen Display system is provided to indicate the operating mode or function selected.

The red LED glows brightly on standby and goes off (or is dim in later versions) when the receiver is on. It flashes brightly when the remote control is operated.

The green LED indicates stereo NICAM/ZWEITON reception. (On early versions also indicates NICAM dual language.)

Switch on from standby	Press programme number or programme up/down
Colour, brightness, contrast, tone	Press analog select - then analog up/down
Volume	Volume up/down or analog up/down
Tuning	Press SEARCH up/down (blue display), Select required programme number then press TUNE STORE (yellow display). If the signal is not correctly identified as a TV signal then the tuning point is lost when TUNE STORE is pressed.
Bandswitch	B1 = VHF I, B2 = VHF III, B3 = UHF Band changes automatically at end of tuning range.
Fine Tune	Not memorised if operated with TV in normal mode (yellow display). Memorised if operated during tuning mode (blue display). AFC remains off (denoted by X after programme number).
System Switch	System 1 indicated by P (PAL, PAL/SECAM stereo). System 2 indicated by S (SECAM B/G, L/L mono). System option stored when tuning.
AV	Press AV for AV1/AV2/TV or apply switching potential to pin 8 of the required AV socket (later versions only). Auxiliary/Decoder mode on AV2 is selected on later versions by first selecting AV1, and while the OSD display shows 'AV1' in large format, press the permanent programme number display button to select the desired AV2 mode: Auxiliary – no OSD symbol or, Decoder – OSD will display the decoder symbol. To memorise, press the analog store button while the OSD display is in large format. See Section 8, page 3 for further details.
NICAM	Stereo signal. The I/II button selects mono (green LED remains on for early versions). Dual language. The I/II button selects language 1 (NICAM), language 2 (NICAM), FM.
ZWEITON	Stereo signal. The I/II button selects mono (green LED goes off). Dual language. The I/II button selects language 1, language 2.
Teletext	Press text for teletext. Press again for mixed text.
Teletext Reveal	Reveal function is self cancelling after 30 seconds.

SCART CONNECTORS AV1, AV2 – PIN CONNECTIONS

Function	AV1	AV2	Level
Audio output right	1	–	500mV typical
Audio input right	2	2	100-800mV
Audio output left	3	–	500mV typical
Audio input left	6	6	100-800mV
Audio output mono	–	1, 3	500mV typical
Blue input	–	7	700mV p-p
TV/AV	8	8	9·5V -12V (not connected on early chassis)
Green input	–	11	700mV typical
Red input	–	15	700mV p-p
S-VHS chroma	15	–	
RGB switching/blanking	–	16	3V via 75 ohm
Video out	19	19	1V p-p / 75 ohm
Video input	20	20	1V p-p / 75 ohm
S-VHS luma	20	–	
Ground	4-5-9-13-17-18-21	4-5-9-13-17-18-21	

Section 2 - Description and Options

INTRODUCTION
The basic receiver comprises a main chassis with 'jungle', audio switch and sound muting modules.

Additional modules can be fitted for options such as NICAM or ZWEITON Stereo, high level teletext , SECAM and system L.

A local control panel is fitted to some models.

The functions of each part or module is listed below.

MAIN CHASSIS

Power supply - Fixed frequency switched-mode type.

Small signal stages - Tuner, PAL decoder, Video and RGB switches.

Deflection - Line (horizontal) driver and output stages. EW modulator. Vertical output stage.

Audio - Mono FM sound detector, tone and volume control stage, stereo power amplifier.

Teletext - Video processor (VIP) and text decoder (CCT).

Tuning - Microprocessor controlled voltage synthesis tuning system.

JUNGLE MODULE
Vision IF, and detector (positive or negative modulation), AFC and video switch.

Quasi-parallel sound IF stage (stereo models only).

Line (horizontal) oscillator and frame (vertical) generator.

AUDIO SWITCH MODULE
Selects audio inputs and outputs of SCART sockets AV1 or AV2.

SOUND MUTE MODULE (Later versions only)
Mutes sound during channel change and standby.

CONTROL PANEL (where fitted)
Infra-red preamplifier for remote control and a local keyboard.

CRT BASE
Integrated circuit video amplifier with black-level sampling.

STEREO MODULE
NICAM digital sound decoder or Zweiton stereo decoder.

TELETEXT EXPANSION
Fastext, Toptext or X26 processors and RGB raster shift switch.

SECAM MODULE
SECAM decoder (Chroma processing only).

SYSTEM L MODULE
AM sound detector and sound/vision carrier inverter for system 'L' signals.

SYSTEM STANDARD OPTIONS
The receiver can be configured as a single standard receiver or as a multi-standard receiver with forced and automatic system switching.

Forced system. System 1 or system 2 can be selected by the system switch on the remote control handset and stored for each programme number.

System 1 (Screen displays 'P')
PAL or PAL/SECAM with NICAM/ZWEITON stereo sound.
Sound standard B/G, D/K, I .
Video polarity: Negative modulation only.

System 2 (Screen displays 'S')
SECAM or PAL/SECAM with mono sound only.
Sound standard: B/G, D/K, I, L.
Video polarity: Negative modulation, or positive modulation-'L' with system L converter.

Automatic System Switching
SECAM decoder: PAL/SECAM if TR852/TR853 are omitted.
FM sound detector: 2 standard B/G-D/K or B/G-I or D/K-I (if L108 is fitted).

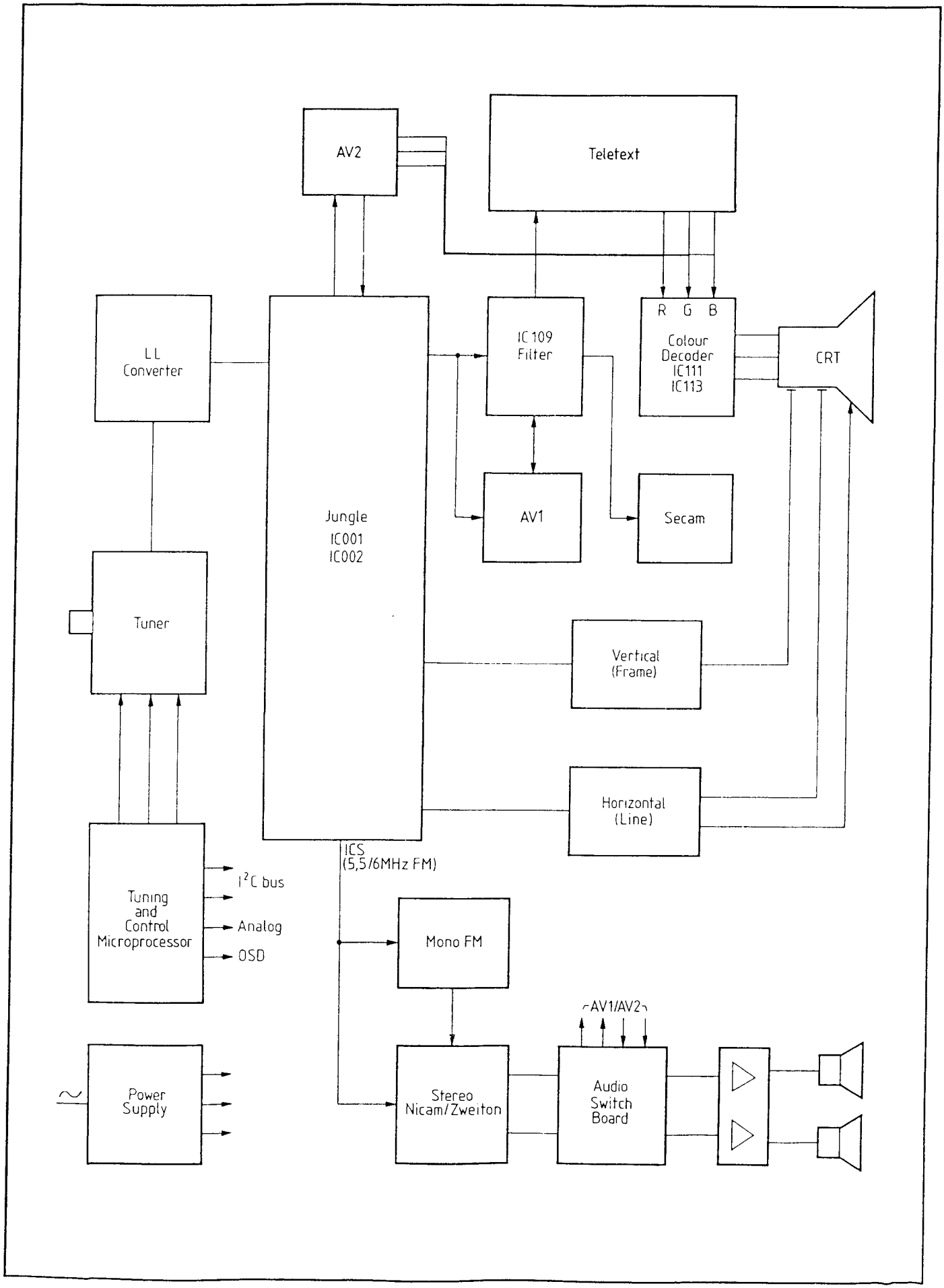


Fig. 2.1. General block diagram of receiver

Section 3 - Safety and Servicing Precautions

READ THESE SAFETY WARNINGS BEFORE SERVICING THIS CHASSIS

This television receiver is manufactured to comply with the CENELEC HD196.S6 Safety Standard (IEC65) or its national variants (BS415-UK, VDE-Germany)

CAUTION
High Voltage. Servicing should only be performed by suitably qualified and experienced personnel.

Use an isolation transformer. Although the chassis is isolated from the mains supply, areas of the main PCB are at mains potential. Use a 250-500VA transformer when servicing.

Read the following instructions before attempting any repairs or adjustments:

SAFETY COMPONENTS
Many electrical and mechanical parts in this chassis have special safety-related characteristics which may pass unnoticed by visual inspection. The protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The fitting of non-approved components may cause a hazard resulting in electric shock or fire. Replacement parts which have special safety characteristics are identified by the following symbol in this manual and its supplements.

Before replacing any of these components, read the parts list supplement in this manual carefully.

X-RAY RADIATION
This receiver is designed so that X-ray radiation is kept to an absolute minimum. Since certain malfunctions or service work may generate potentially hazardous radiation with prolonged exposure at close range, the following precautions should be observed.

While repairing, ensure that the high voltage does not exceed 27·5KV. (At a beam current of 1 mA).

For normal operation, the receiver should require only 25·5KV ±0·5KV (at a beam current of 1 mA).

The only source of X-ray radiation in this TV receiver is the picture tube. For continued X-ray radiation protection, the replacement tube must be of the same type as specified in the parts list.

HIGH VOLTAGES
Potentials as high as 27,500 volts are present when this receiver is operating. Operation of the receiver outside the cabinet or with the back cover removed presents a shock hazard. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high-voltage equipment.

Always discharge the picture tube anode to the chassis ground to prevent shock hazard before disconnecting the anode cap. Use a lead with a 10KΩ series resistor. Completely discharge the high potential of the picture tube before handling. The picture tube is highly evacuated and, if broken, glass fragments will be violently expelled.

FUSES, FUSIBLE RESISTORS AND POWER RESISTORS
In the event of a fuse or fusible resistor requiring replacement it must be replaced with the type specified in the parts list. Power and fusible resistors should be mounted in the same position above the circuit board as the original.

GENERAL SERVICING PRECAUTIONS
Disconnect the television from the mains supply before discharging the picture tube anode or before removing or refitting any component, circuit board, module or connector.

Fitting a wrong part or incorrect polarity of electrolytic capacitors may result in an explosion or fire.

Test the high voltage (EHT) only with a high voltage meter or a multimeter equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".

Do not spray any chemicals on or near this instrument or any of its assemblies.

Ensure that all power transistors and integrated circuits have their heatsinks correctly fitted before connecting power. Use heatsink compound where necessary.

ELECTROSTATICALLY SENSITIVE DEVICES
Some integrated circuits in the tuning and teletext circuits can be easily damaged by static electricity.

Switch off before removing or replacing any integrated circuit.

Do not remove a replacement electrostatically sensitive device from its protective package until you are ready to install it.

Do not use freon-propelled chemicals since these can generate electrical charges sufficient to damage electrostatically sensitive devices.

BEFORE RETURNING THE TELEVISION
After servicing is completed, carry out the following safety checks.

Inspect lead dress to make certain that leads are not pinched or damaged.

Ensure that no loose parts are lodged within the receiver.

Inspect and ensure that all protective devices such as non-metallic control knobs, insulators, cabinet backs, adjustment and compartment covers and shields, isolation resistors, capacitor networks, mechanical insulators are refitted correctly.

If a mains plug is not fitted, ensure that the mains connection label is fitted

Perform flash, insulation and load tests using a suitable appliance tester.

Section 4 - Adjustments and Alignment

SERVICE ADJUSTMENTS

Equipment Required
Digital voltmeter – 0-200V
Analog voltmeter – (or digital voltmeter with bargraph)
Oscilloscope – single beam 15MHz Oscilloscope probe x100
Screwdriver – 1·5mm x 0·8mm (insulated shaft)

WARNING. Parts of the chassis are at mains potential. Use a 250-500VA mains isolating transformer when servicing.

PREPARATION
Check that all cables and the CRT base socket are connected correctly. Serious damage can occur if the receiver is operated without the picture tube ground (aquadag) connected to the chassis (via CRT base). Set all preset potentiometers in the mid position except RV100, and RV601-603 (where fitted) which must be set fully anticlockwise.

IMPORTANT. Where two alignment methods are given the first is the preferred method.

TEST POINTS
The legs (pins) of the components or pins of modules are used as test points. NOTE: The pins for the modules are numbered from the RIGHT (component side uppermost).

POWER SUPPLY (Set 154V HT)
Connect the receiver to a mains supply of 200-250V AC. Connect a digital voltmeter between the '+154V' test point and chassis ground. (Measure at R330 - end nearest L101). Switch the receiver on. Adjust potentiometer RV100 (HT) for 154V ±0·5V. Check the regulation by switching between standby and normal operation. The voltage reading should not change by more than 0·25V.

HORIZONTAL FREQUENCY (LINE HOLD) – Jungle Module (see Fig. 4.2.)
Desolder pin 13 (sync) of the jungle module. Tune to a standard TV signal. Adjust the potentiometer RV001 for minimum rolling of the picture. Resolder pin 13.

HORIZONTAL SHIFT (LINE PHASE) – Jungle Module
Adjust potentiometer RV003 to centre the picture.

PICTURE WIDTH
Adjust potentiometer RV104 for correct width. The picture should overscan by 3% or half a castellation of a standard test card pattern.

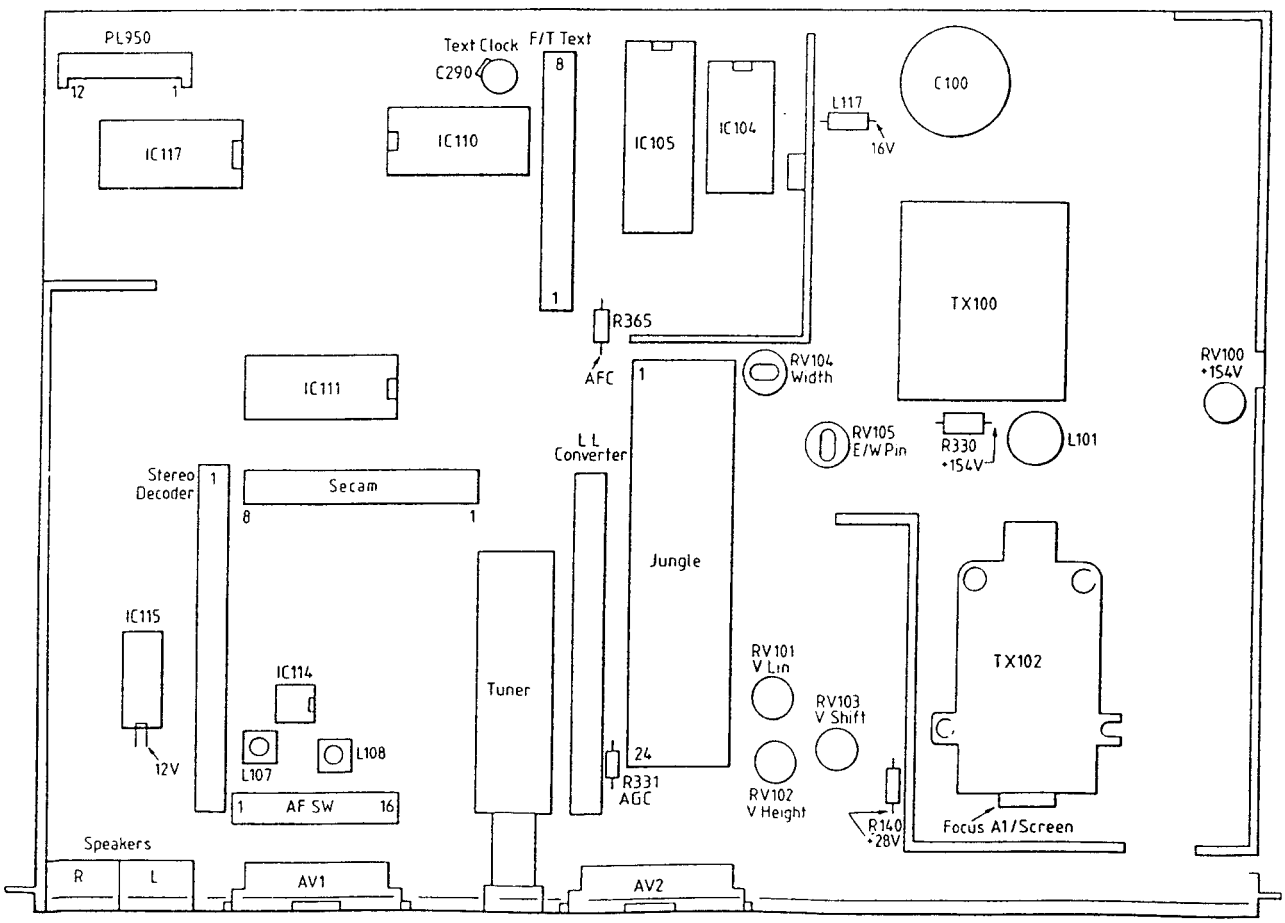


Fig. 4.1. Main chassis alignment points

HORIZONTAL (LINE) LINEARITY – Not adjustable.
Warning: Do not adjust coil L103.

FOCUS
Adjust the focus control for best focus on a picture of normal brightness and contrast.

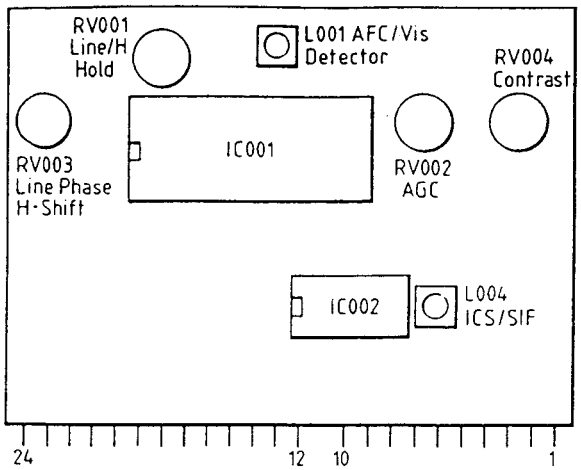


Fig. 4.2. 'Jungle' module alignment points

HORIZONTAL (E/W) PINCUSHION
Adjust potentiometer RV105 for straight sides of the test pattern.

VERTICAL (FRAME) HEIGHT AND LINEARITY
Adjust potentiometer RV102 (amplitude/height) for correct height. The picture should overscan by 3%. Adjust potentiometer RV101 (V-LIN) for best linearity. Adjust potentiometer RV103 (V-Shift) for correct vertical position.

TUNER AGC – Jungle module
Method 1
- Tune to a UHF signal (channel 21-50) that has a level of 1mV (60dBμV).
- Connect an analog voltmeter (10V range) between the AGC test point and ground – measure at R331 – end nearest the SCART socket AV2.
- Turn potentiometer RV002 (AGC) fully anticlockwise.
- Turn RV002 clockwise until the voltage begins to fall, then turn it back (anticlockwise) until the voltage returns to the previous level. Do not continue to rotate RV002 after this point.
- Check the adjustment by varying the UHF signal level. The AGC voltage should begin to fall for signals of 1·2mV or above.

Method 2
- Tune to a UHF signal that has a level of 1·2mV.
- Turn RV002 clockwise until noise (snow) appears on the screen.
- Turn RV002 anticlockwise until the snow just disappears.
- Increase signal level to 30mV and check that overloading or sound buzz does not occur.

NOTE: This method should not be used in Germany where FTZ regulations apply.

PRESET CONTRAST – Jungle module
Tune to a test pattern containing full amplitude signals (peak white and black). Connect an oscilloscope via a x100 probe to the R or G cathode on the picture tube base – oscilloscope set to 0·5V/div AC coupled, 10ms/div TV-H mode. Set contrast to maximum, brightness to minimum. Adjust RV004 for an amplitude of 100V peak-to-peak (peak white to black level). See Fig. 4.4.

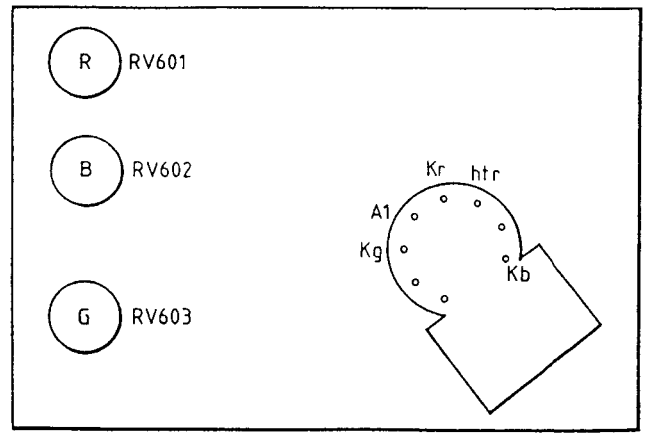


Fig. 4.3. CRT Base module (viewed from rear)
Note RV601, RV602, RV603 normally replaced by links

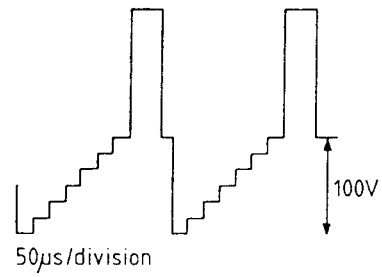


Fig. 4.4. Preset Contrast adjustment

A1 (SCREEN)
The A1 control is used to adjust the level of the black level sampling point. See Fig. 4.5.

Tune to a TV signal then turn brightness and contrast controls to minimum.
Connect a x100 (100 megohm) probe to the oscilloscope – oscilloscope set to 0·5V/DIV-DC coupled (5ms/DIV-TV V mode). Ground the oscilloscope input and adjust the oscilloscope cursor or vertical shift control for zero (0V). Connect the probe to each of the picture tube cathodes (R,G,B) in turn and note which cathode gives the highest sampling point level. Leave the probe connected to the cathode which gave the highest level and adjust the A1 (screen) control for a sampling point level of 140V.

NOTE: If a x10 oscilloscope probe is used the reading will be affected by its lower impedance. In this case set the sampling point level to 125-130V.

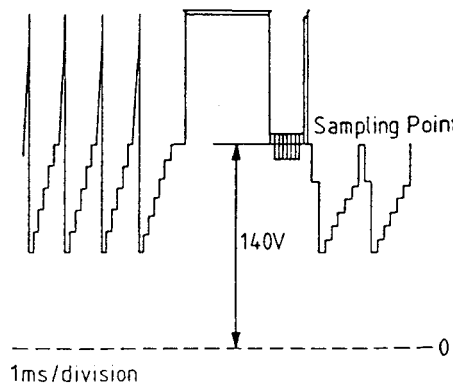


Fig. 4.5. A1/Screen adjustment

GREY-SCALE (WHITE BALANCE) – CRT base
Cut off (background or low lights): Adjustment is automatic.
Drive (gain) adjustment: Adjustment is normally not necessary and links (jumpers) are fitted in place of potentiometers RV601-603.

Potentiometers can be fitted to extend the life of an ageing picture tube or if a tube with a non-standard phosphor is used. Turn all the potentiometers fully anti-clockwise (viewed from copper side of PCB). Adjust the appropriate potentiometer to remove the prominent colour. At least one potentiometer must be left fully anti-clockwise after the adjustment.

NICAM STEREO DECODER: See section 10

ZWEITON STEREO DECODER: See section 11

SYSTEM LL CONVERTER: See section 12

TELETEXT CLOCK - Main chassis
Method 1
Tune to a signal with teletext and select mixed text mode. If a teletext display does not appear, adjust the trimmer capacitor C290 until a display appears (may be corrupted).
Connect a 1k5 resistor between IC110 (SAA5231) pin 24 and ground.
Adjust C290 until the teletext display is stationary.

Method 2
Tune to a signal with teletext and select mixed text mode.
Reduce the signal level gradually until the text display loses lock (becomes non-synchronised).
Adjust C290 for a stationary text display.
Reduce the signal level again and repeat the procedure until no further improvement is possible.

ALIGNMENT

EQUIPMENT REQUIRED
Analogue voltmeter (or digital voltmeter with bargraph)
Oscilloscope – dual beam 20MHz
Oscilloscope probes x10, and x10 active (low capacitance) type
PAL pattern generator (B/G, I)
SECAM pattern generator (B/G or video output)
Balun transformer (75/300 ohm or 60/240 ohm)
Ceramic alignment tool 1·3mm x 0·8mm (short handle)

ALIGNMENT FREQUENCIES

System	Vision IF	SAW filter	Sound IF(mono/stereo)
B/G/H	38·9MHz	OFWG 3255	5·5MHz / 5·85MHz
B/G(FTZ)	38·9MHz	OFWG 3264	5·5MHz / 5·742MHz
I(UK)	39·5MHz	OFWJ 3250	6·0MHz / 6·552MHz
I(Ireland)	38·9MHz	OFWJ 3251	6·0MHZ / 6·552MHz
B/G-D/K	38·9MHz	OFWK 3202	5·5MHz and 6·5MHz

IMPORTANT - Unless specified all alignments in this section are performed using PAL signals with negative modulation (CCIR - B/G/H or I, OIRT-D/K)

AFC - VISION DETECTOR – Jungle module
Warning. Do not adjust the AFC coil L001 unless the correct signals and instruments are available. It is not possible to align L001 by 'eye'.

To align the detector coil L001 an IF signal of the correct frequency must be injected into the IF input of the jungle module.

The 3010UEC tuner (UHF only) has an IF injection point where the signal can be injected via a 100pF capacitor. The point is located in the right side of the tuner, near its top. The 2000KHC tuner (VHF/UHF) does not have an injection point so the signal must be injected via a balun transformer directly into the IF input pins of the Jungle module. To connect the balun transformer, desolder links LK104 and LK105 (or remove the system L module if fitted) and connect the balanced outputs to pins 18 and 17 (IF1/0, IF2/0) of the jungle module. Connect the signal generator to the unbalanced (60/75 ohm) input. See Fig. 4.6.

METHOD
Connect the oscilloscope via a x10 probe to the unswitched video output (CVID5) at pin 19 of SCART socket AV2 or pin 8 of the jungle module. Connect the voltmeter (12V range) to the AFC test point (measure at R365 - end nearest C300). Inject an IF signal at the correct frequency and modulated with a grey-scale (staircase) pattern. Adjust coil L001 for a linear waveform then for an AFC voltage of 6·0V ±0·5V. Allow the receiver to operate for 5 minutes and readjust L001 again if necessary.
NOTE: The signal level must be sufficient to prevent noise appearing on the screen otherwise the AFC voltage will be affected.

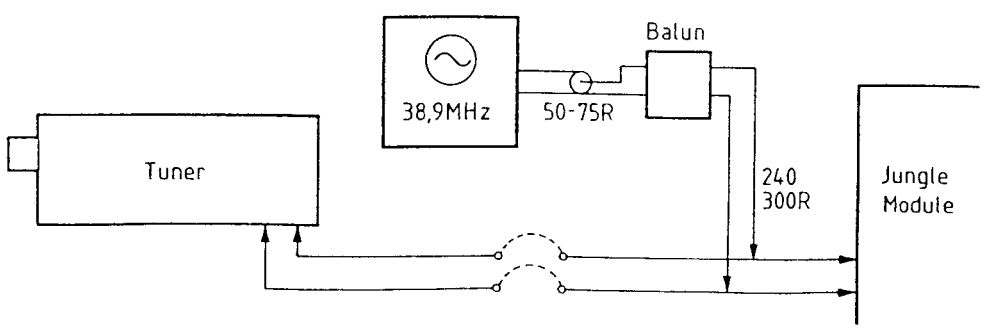


Fig.4.6. Signal injection via a balun transformer for 2000KHC VHF/UHF tuner

PARALLEL SOUND IF
(Stereo models only System B/G-I) – Jungle module

Method 1
Inject an IF signal into the jungle module via the tuner injection point or Balun transformer. (See preceding paragraphs on AFC alignment for the correct injection point and IF frequency.) For best results the IF signal should be modulated with a monochrome grey-scale pattern and the 5·5 or 6·0MHz FM carrier switched off.

- Connect the oscilloscope via a x10 probe to pin 10 of the jungle module (ICS or 5·5/6·0MHz FM output)
- Adjust coil L004 for minimum amplitude of the video components. If L004 is tuned past the correct point the video signal will become inverted and the amplitude increase.

Method 2
IMPORTANT: To ensure accurate alignment, the AFC detector must be correctly aligned and the AFC not defeated during tuning (do not operate the fine tune controls).

- Tune to a B/G D/K or I signal. For best results use a monochrome pattern and switch the sound carrier off.
- Connect the oscilloscope via a x10 probe to pin 10 of the jungle module.
- Adjust coil L004 for minimum amplitude of the video signal.

NOTE: To obtain a clear display of the residual video signal a monochrome test pattern should be used and the FM and NICAM or ZWEITON sound carriers switched off. If a suitable signal is not available then align for minimum amplitude of the sync pulses.

MONO FM SOUND DETECTOR
(Not fitted on B/G ZWEITON receivers)

- Tune to a TV signal that has the FM sound carrier modulated with a 1kHz tone. (See table for correct frequencies).
- Connect the oscilloscope to the MONO FM output (measure at resistor R250 - end nearest tuner or at link LK109).
- Adjust coil L107 for maximum undistorted audio output.
- Coil L108 is fitted on some dual standard receivers to detect the second FM sound carrier (B/G-D/K, B/G-I). Tune to a signal with the alternative sound carrier (D/K or I) and adjust L108 for maximum undistorted audio output. Retune to the first signal and check that the adjustment of L107 has not been affected.

COLOUR DECODER (PAL)

No adjustment necessary.

SECAM DECODER – SECAM module

IMPORTANT: If the SECAM decoder is fitted with TR852/853 for forced PAL/SECAM operation then select system 2 (S) before commencing any alignment.

Bell filter
- Tune to a SECAM signal with a split (red/blue) pattern or colour bars.
- Connect the oscilloscope via an active (low capacitance) x10 probe to the chroma input (IC851 pin 3).
- Adjust coil L854 until the B-Y and R-Y signals are of equal amplitude. See Figs. 4.8. and 4.9.

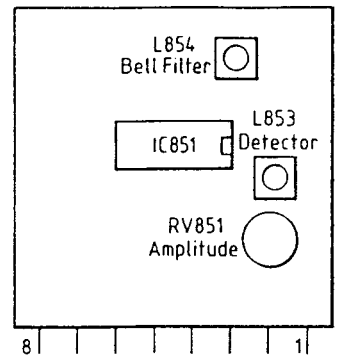


Fig. 4.7. SECAM module

- Reduce the SECAM signal level until the picture becomes noisy. If L854 is correctly aligned an equal number of red and blue streaks or flashes will be visible.
- If one colour is predominant, make a small adjustment to L854 to equalise the number of coloured streaks.

NOTE: Most passive oscilloscope probes have a capacitance of 12-20pF which affects the tuning of L854. If the probe has a capacitance of more than 3pF then L854 will require readjustment for equal red and blue flashes.

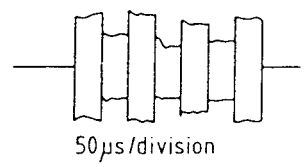


Fig. 4.8. Bell filter signal waveform before adjustment

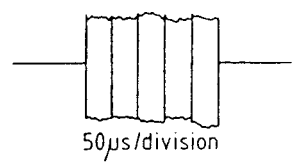


Fig. 4. 9. Bell filter signal waveform after adjustment

SECAM DISCRIMINATOR
Method 1 (Vector Method)
- Switch the oscilloscope to XY mode and connect the Y input to pin 5 (B-Y output) of the SECAM module. Connect the X input to pin 6 (R-Y output).
- Tune to a SECAM signal with a test pattern that contains both colour and monochrome.
- Adjust the colour (saturation) level with the remote control to approximately 50 per cent (on screen display bar at mid point). Note: The picture may be in monochrome until L853 is adjusted.

SECAM DISCRIMINATOR

Method 1 (continued)

- Adjust coil L853 until colour appears on the screen. The oscilloscope should display a cross shaped vector. See Fig. 4.10. Each arm of the cross will have a bright spot which corresponds to the detected black level.

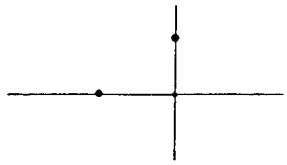


Fig. 4.10. L853 adjustment vector display

- Adjust coil L853 and preset potentiometer VR851 until the two bright spots are superimposed near the centre of the cross. See Fig. 4.11.

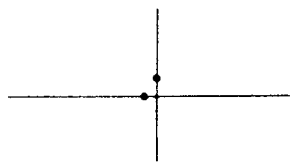


Fig. 4.11. L853 adjustment – bright spots superimposed

- Check that the monochrome areas are not tinted. Small adjustments may be made to L853 to remove any coloured tint.

Method 2 (Amplitude Method)

- Connect a dual beam oscilloscope to pins 5 and 6 of the SECAM module (Y1 to pin 5, Y2 to pin 6). Set the oscilloscope to sum/add mode and TV-H sync.
- Tune to a SECAM signal with full amplitude colour bars and grey-scale pattern.
- Adjust the colour (saturation) level to approximately 50% (on screen display bar at mid point).

Note: The picture may be monochrome until L853 is adjusted.

- Adjust coil L853 until colour appears on the screen. Continue adjustment until the intensity of the coloured bars on the screen is approximately correct.
- Adjust the preset potentiometer VR851 for 1·6V peak-to-peak amplitude of the R-Y and B-Y signals.
- Adjust L853 until the detected black levels corresponding to the monochrome areas of the test pattern coincide with the clamped black level during horizontal (line) flyback period. See Figs. 4.12 and 4.13.

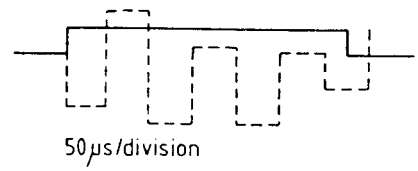


Fig. 4.12. L853 – before adjustment

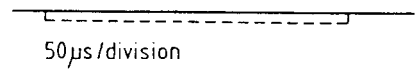


Fig. 4.13. L853 – after adjustment.

- Repeat the adjustment of VR851 and L853. If the monochrome areas are tinted, readjust L853 to remove any coloured tint.

Section 5 - Power Supply and Deflection

CIRCUIT DESCRIPTION

POWER SUPPLY

An RFI filter board is fitted in series with the AC supply to suppress low frequency components generated by the switched-mode power supply.

The filter is fitted to the live (supply) side of the mains switch rather than on the main chassis to reduce the level of conducted interference entering the mains supply cable.

A mains plug with an integral filter may be fitted to meet the EMC requirements of certain countries. This must NOT be removed or replaced by a non-filtered plug.

The power supply is a fixed frequency flyback type operating at 26kHz providing mains isolation and 3 secondary supplies of 154V, 26V and 16V. Secondary feedback via the opto-isolator, TC101, is used to give good regulation.

A TDA8380 integrated circuit (IC100) is used to control the switched-mode power supply. Resistor R101 supplies the initial start-up current to pin 5. When the power supply is operating the output from winding 12/14 is rectified by D106 to maintain the supply to pin 5.

To ensure fast turn-off times and reduced dissipation of the chopper transistor (TR100) IC100 has 2 outputs. Pin 1 goes high to charge C122 and turn TR100 on. The maximum base current is limited by R103 and D104. To switch TR100 off, pin 16 is connected to ground allowing the stored energy in L100 to provide a reverse EMF to switch TR100 off quickly. D104 also conducts during switch-off.

Resistors R319, R328 and capacitors C105, C106 form two snubber networks which damp the flyback pulse and limit spikes to protect the chopper transistor.

Transistors TR102 and TR103 provide a constant current source for the zener reference diode D112. This clamps the emitter of transistor TR104 at 6·2V.

If the secondary voltages rise, the base voltage of TR104 also rises, turning the transistor further on. The increase of current through the LED in the opto-isolator (pins 1, 2) turns the photo transistor on (pins 3, 4) reducing the voltage at pin 9 of the TDA8380. The mark-space ratio of the chopper transistor drive is reduced so reducing the energy in the transformer and thus the secondary voltages.

Overload or short-circuit protection is provided within the control circuit by monitoring the voltage across resistor R102. If a partial or short duration overload occurs, such as a picture tube flashover, the control IC will shut down for one or two cycles. Should a short-circuit or heavy overload occur the power supply will then trip and reset to the soft-start mode. If the short-circuit remains the power supply will continue to trip.

The TDA8380 also has over-voltage protection in case the opto-isolator or feedback circuit fails.

HORIZONTAL (LINE) DEFLECTION

The line oscillator and timing circuits are part of the TDA4504 jungle circuit IC001.

There are 2 control loops to enable accurate sandcastle timing and to compensate for storage time delays in TR128. Automatic loop time-constant switching and sound muting are also included.

Synchronisation pulses are generated by the sync separator (pin 28) which receives video (FBAS) signals from either a buffer amplifier (TR120, 121) or via the Teletext VIP circuit (IC110).

In the first control loop the RC oscillator is synchronised with the synchronising pulses from the sync separator.

The phase detector produces an error voltage on pin 27 which controls the frequency of the RC oscillator (pin 26).

The coincidence detector and logic circuits select the correct time-constant for weak or strong signals. The circuit also detects signals from a VCR or video disc player and selects the correct time-constant.

Picture centring (horizontal shift) is achieved by applying a DC potential from the H-SHIFT preset (RV003) to the second phase detector circuit (pin 31).

In later versions, an additional horizontal shift is required for the RGB mode to compensate for the shorter delay time of the video signals. When RGB is selected, transistor TR732 on the Fastext or Toptext module is turned off so current via resistor R741 is injected into the phase shift pin (pin 31).

The square-wave horizontal output signal from pin 29 of the TDA4504 jungle circuit (IC001) drives the line driver transistors TR106/TR105. Two transistors are used in a Darlington configuration to minimise the loading of the TDA4504.

The line output (FBT) transformer TX102 provides an EHT potential of 25-26kV, 28V for the frame (vertical) stage, 7·5V for the 5V STBY, 200V video and the picture tube heater supplies.

The E/W pincushion correction uses a diode modulator driven by IC107 (TDA8145). Picture width is adjusted by potentiometer RV104 and pincushion by RV105. The modulator diodes D116, D117 act as switches which effectively connect or disconnect capacitors C131 and C132. This allows the width to be varied without affecting the flyback tuning or the EHT.

The diodes also act as rectifiers, producing a voltage at their common connection, which is filtered by the loading coil L103 to produce approximately 14V DC at pin 5 of IC107.

The TDA8145 operates by converting the 50Hz frame sawtooth signal from IC106 into a parabolic waveform which is then applied to a class D amplifier. Pin 5 is effectively a variable resistance - low resistance reduces the picture width. Vertical linearity is adjusted with potentiometer RV101 and height (amplitude) with RV102.

Vertical shift or frame centring is achieved by injecting a DC current from potentiometer RV102 into the vertical scan coil of the deflection yoke.

The TDA3654 power amplifier (IC106) has a booster circuit to provide the high voltage for flyback. During the scan, pin 8 is low allowing capacitor C147 to charge via the diode D125. At the start of flyback, pin 8 is connected to pin 9 so that the voltage across the capacitor is added to the voltage at pin 9.

The circuit consisting of D124, D133, R158, R219 is used to provide a vertical reference pulse for the on-screen display generator.

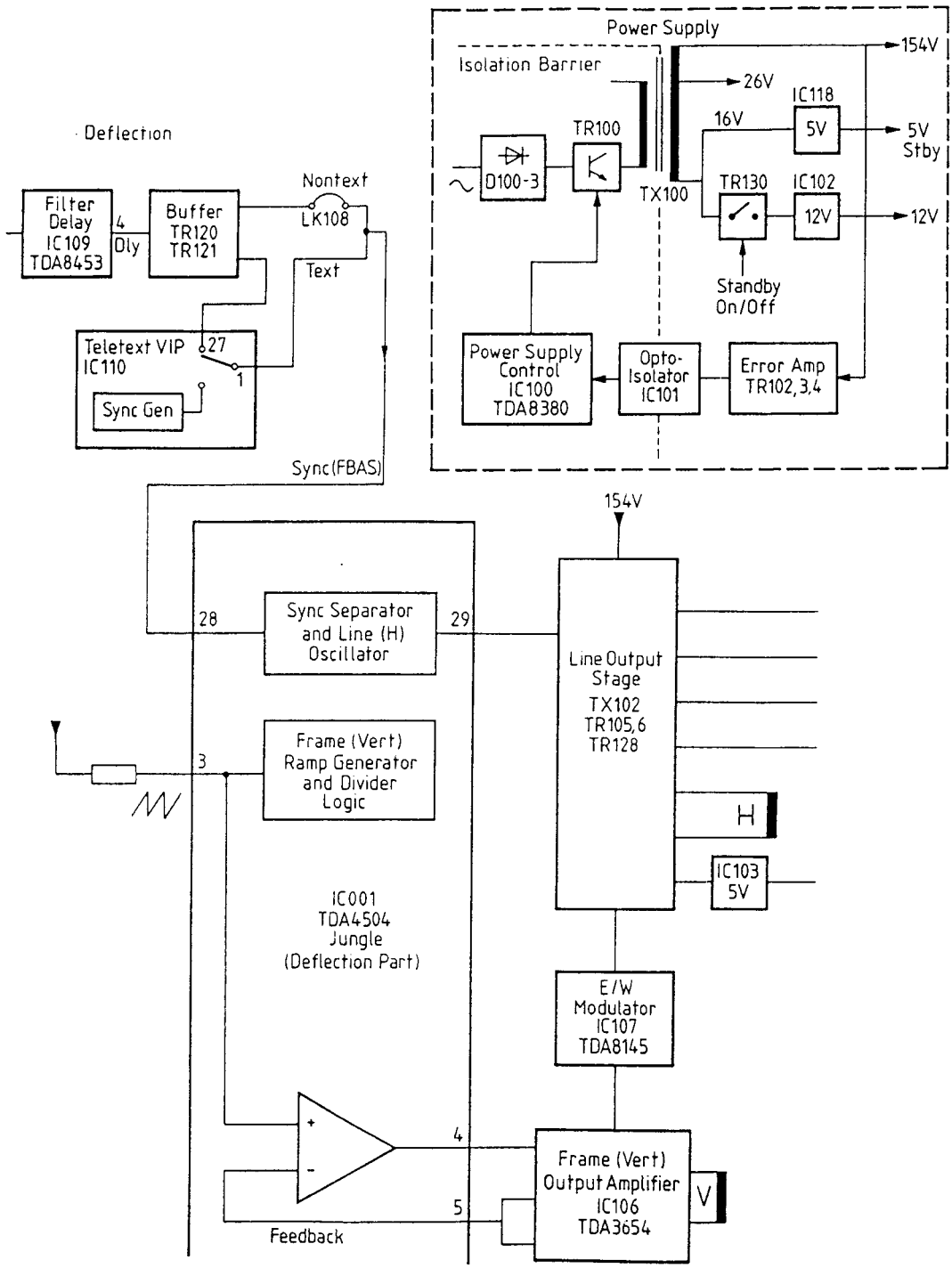


Fig. 5.1. Power Supply and Deflection block diagram

VOLTAGES

IC100 (TDA8380)

NOTE: Voltages are measured with respect to pin15, power supply ground (pins 14, 15 or heatsink).

Pin 1 ..... 2·5V/26kHz drive
Pin 2 .....15·3V
Pin 3 ..... 0·1V
Pin 4 ..... Ground
Pin 5 .....15·3V
Pin 6 ..... 2·6V
Pin 7..... Trips!
Pin 8 ..... 0.9V
Pin 9 ..... 2·1V
Pin10 ..... 3·2/Triangle 3·4Vpp
Pin11 ..... 15·3V
Pin12 ..... 6·2V
Pin13 ..... Trips!
Pin14 ..... Ground
Pin15 ..... Ground
Pin16 ..... 1·2V

IC101 (TCTD1101)

Pin 1 ..... 15·3V Measured from chassis side
Pin 2 ..... 14·3V Measured from chassis side
Pin 3 ..... NC
Pin 4 ..... 0V Measured from power supply side
Pin 5 ..... 2·1V
Pin 6 ..... NC

IC001 (TDA4504)

Pin 3 ..... 3V/50Hz sawtooth 1·7Vpp
Pin 4 ..... 3·4V/50Hz flyback 3.8Vp
Pin 5 ..... 3·5V/50Hz sawtooth 0.8Vpp
Pin 7 ..... Ground
Pin 8 .....11·5V Vcc
Pin19 ..... Ground
Pin 26 ..... 2·8V/15625Hz sawtooth
Pin 27 ..... 2·8V
Pin 28 ..... 4·5V/video 1Vpp
Pin 29 ..... 1·6V/15625Hz 3.6Vpp
Pin 30 ..... 1·5V/sandcastle
Pin 31 ..... 3·2V

IC106 (TDA3654)

Pin 1 ..... 2·2V/50Hz frame 2·3Vpp
Pin 2 ..... Ground
Pin 3 ..... 2·2V/50Hz frame 2·3V
Pin 4 ..... 0V
Pin 5 ..... 1·5V
Pin 6 ..... 27V/50Hz 2·1Vpp
Pin 7 ..... 1·4V/sandcastle
Pin 8 ..... 9V/50Hz flyback 21Vpp
Pin 9 ..... 28V Vcc

IC107 (TDA8145)

Pin 1 ..... 14·5V/50Hz frame 44Vpp
Pin 2 ..... 13·8V/50Hz SAW 20Vpp
Pin 3 ..... 8·2V
Pin 4 ..... Ground
Pin 5 ..... 14·5V/15625Hz 28Vpp
Pin 6 ..... 28V Vcc
Pin 7 ..... 7·8V/50Hz parabola
Pin 8 ..... 7·6V/15625Hz sawtooth

FAULT GUIDE

Dead - no operation

Check for 310-340V DC on TR100 collector.
Check for 9-16V on IC100 pin 5.
Check D106 short-circuit, IC100.

Tripping (1-2HZ)

Check for short-circuits on +154V (D110) and 16V (D107) rails.

Low output (voltages rise when secondary loads disconnected)

Check for D106, R116 open or TX100 shorted turns.
Check D112, TR104, IC101.

No line (H) deflection

Check for horizontal drive from pin 22 of the jungle module.
Drive OK - check TR106, TR105, R174.
No drive - check IC001, C022.

No frame (V) Deflection

Check for 50Hz ramp at IC001 pin 3.
No ramp - check D113 (33V), IC001, C013.
Ramp OK - check IC106 and all feedback components.

Picture not synchronised

Select Teletext – If display is stable check video to IC110 pin 1 (no video - check for video at AV1 pin 19. Also check TR120, TR121 and IC110). If display is not stable check sync signal at pin 13 of jungle module and sandcastle pulse at pin 15). No sandcastle – check IC001, C156, R173.

No east/west pincushion correction

Check D117, R366, L116 (shorted turns), L103 (open), IC107. Also check that the slider of RV104 does not short to the jungle module.

RV104 overheating

Check IC107 and C150.

WARNING: R371 or L116 will fail if the receiver is operated with the scan coils (H-DY) disconnected.

Section 6 - Vision and Colour Decoder

CIRCUIT DESCRIPTION

A MOSFET tuner is used to ensure good signal handling characteristics and intermodulation performance.

The tuner uses dual-gate MOSFETS for the RF stages and a TDA5330 integrated circuit for oscillator, mixer and IF amplifier. The output is balanced and can drive a SAW filter directly. Typical tuner gain is 40dB.

On stereo models a dual-output SAW filter with separate sound and vision outputs is fitted. This allows a quasi-parallel sound IF circuit to be used which gives a superior signal to noise ratio essential for stereo sound.

As the vision output effectively has an internal sound trap the external sound trap CF001 is not required.

For mono sets a conventional single output SAW filter with intercarrier sound can be fitted.

VISION IF

The vision IF and detector, AGC and AFC circuits are part of the TDA4504 jungle circuit IC001.

The IF amplifier has a symmetrical input (pins 9, 10) and gain controlled stages. The detector uses peak level sensing, operating on sync tips with negative modulation or peak white with positive.

A 90 degree phase-shift network is used together with the synchronous video demodulator to provide both AFC and video detection. Only one reference coil is required. (L001)

With very weak input signals the AFC signal can become noisy and errors may occur. To prevent this the AFC detector is switched off during weak or no signal conditions.

For system L operation the video demodulator can be switched to positive modulation by forcing pin 32 high. The AFC slope can be reversed for system L band I operation by grounding pin 12.

After demodulation the video signal from pin 20 passes through choke L006 to remove any remaining IF frequency and demodulator products. On mono sets the ceramic sound trap CF001 is used to remove the 5·5 or 6·0MHz sound carrier. After filtering, the video passes to the TV/AV switch in the TDA4504 and also to transistor TR001 which provides a buffered 1V peak video signal to the SCART socket AV2. This output is unswitched and is intended for driving a decoder or other unit which requires a TV only video signal.

The TV/AV switch is controlled by pin 18 (high for external video from SCART socket AV1, low for TV video via pin 16).

The output from the TV/AV switch (pin 15) passes through the emitter follower transistor, TR002, to pin 20 (CVID3) of the jungle module. Potentiometer RV004 (preset contrast) is used to set the video signal to 1Vpp.

COLOUR DECODER CIRCUIT

The colour decoder uses 3 integrated circuits:

IC109 (TDA8453A) is a filter circuit with chroma bandpass filter, chroma trap and Luma delay lines together with AV1/AV2 and S-VHS switching.

IC111 (TDA8391) is a PAL/NTSC decoder with matrixing, RGB switching and auto-grey-scale circuit.

IC113 (TDA8451A) is a solid state chroma delay line.

A SECAM decoder module can be fitted in parallel with the PAL decoder to process SECAM chroma signals.

FILTER/DELAY IC109

The TDA8453A IC uses charge coupled (CCD) devices for the chroma bandpass and chroma trap filters. These have a flat frequency response and group delay which gives good colour performance.

No adjustment is required as the centre frequencies are directly related to the clock frequency which is derived from the colour decoder (IC111).

IC109 has two composite video inputs which are selected by the switch control pins 5 and 7.

Pin 5 low, 7 low - Pin 16 (CVBS1) selected (Video from jungle module)
Pin 5 low, 7 high - Pin 18 (CVBS2) selected (Video from AV2)
Pin 5 high - S-VHS mode.

The video from the AV1/AV2 switch passes to the chroma bandpass filter, Luma delay line and Luma trap.

As the chroma filter and trap introduce a delay of approximately 1020ns, the video signal for synchronisation and teletext must be delayed by a similar period. The output of the video delay line at pin 4 has a very low drive current so a buffer amplifier (TR120, TR121) must be used to prevent the output from being loaded. In S-VHS mode, the chroma bandpass filter and chroma trap are not required. The chroma signal from pin 15 of AV1 enters after the chroma trap at pin 10. The luminance signal from pin 20 of AV1 enters at pin 2. The additional 1020ns delay is also not necessary so the video delay line is bypassed.

S-VHS can only be selected if the receiver is in AV1 mode; in TV or AV2 modes, diodes D137 or 138 conduct preventing IC109 pin 9 from rising.

PAL DECODER IC111

The TDA 8391 IC is an alignment free version of the TDA3562A.

The Luma signal from the filter circuit, IC109, enters IC111 at pin 25 where it is clamped before passing to the Y-RGB matrix circuit.

The chroma signal passes through an ACC amplifier at pin 30 before being demodulated into ± (-R-Y) and (-B-Y) signals at pins 26, 27.

The (-R-Y) and (-B-Y) signals then pass through the solid state delay line IC113 (TDA8451) where they are delayed by 64µs and summed in the PAL matrix to produce continuous (-R-Y) and (-B-Y) signals.

Continued on page 3

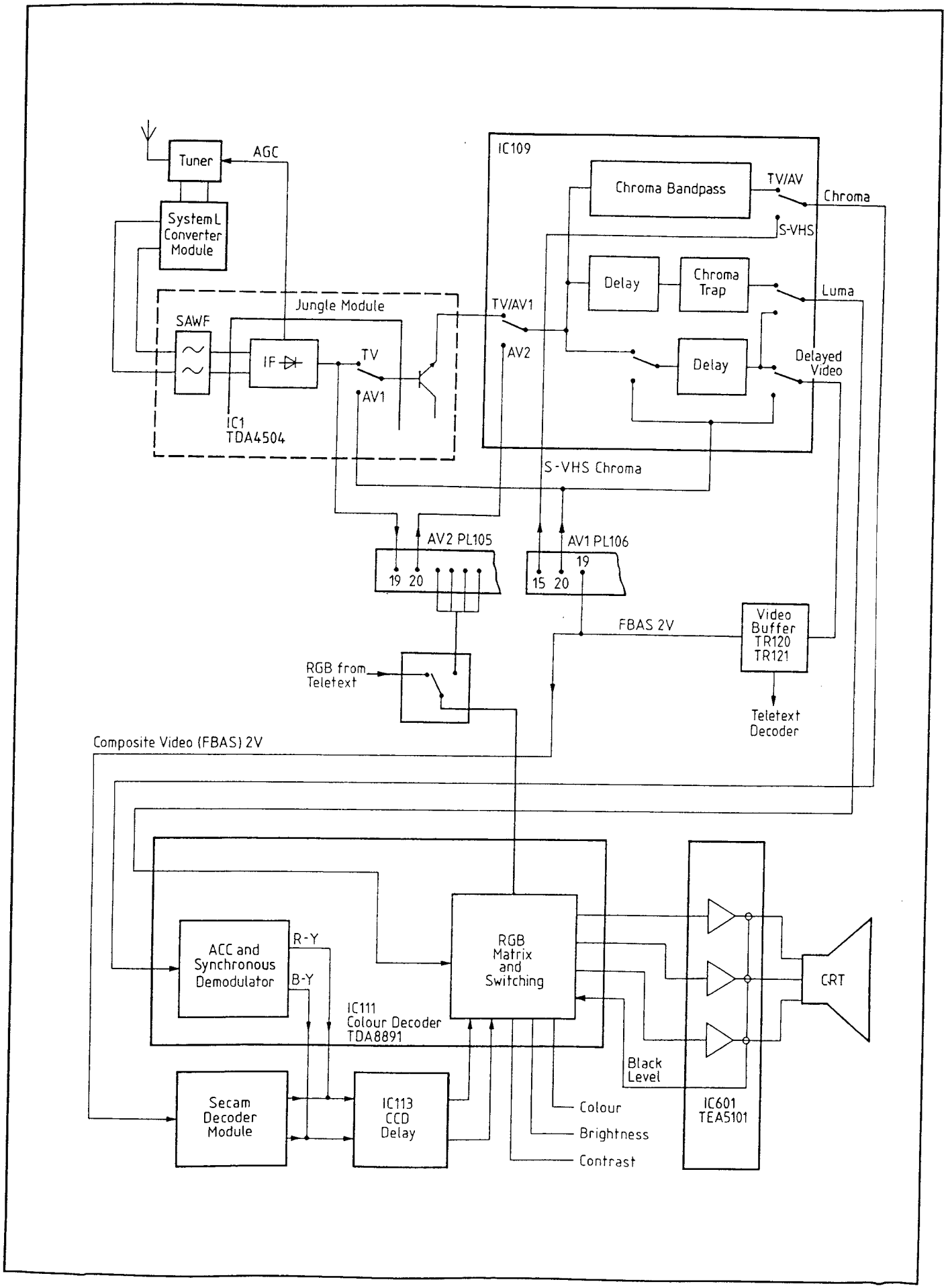


Fig. 6.1. Block diagram of Vision and Colour Decoder

PAL DECODER IC111 - continued
With a conventional glass delay line the U and V signals are delayed and matrixed at 4·43MHz before being demodulated into B-Y and R-Y signals. As the solid-state delay line has a wide bandwidth the sequence can be reversed by demodulating the U and V signals before the delay line.

The (-R-Y) and (-B-Y) signals from the solid-state delay line enter the TDA8391 at pins 21 and 22 where they pass through a variable gain amplifier which is controlled by pin 6 (colour saturation).

After the R-Y, B-Y and Luma signals are combined in the Y-RGB matrix the RGB signals pass through the RGB switch and brightness and contrast amplifiers to the RGB output at pins 13 (R), 17 (G) and 15(B).

External RGB signals from the SCART socket, teletext or on-screen display are applied to pins 14, 18, 16. RGB switching is controlled by pin 9.

RGB SWITCHING
IC108 (TEA5114) is a 3-pole 2-way RGB switch.

If pin 8 is high, IC108 accepts RGB signals from the teletext decoder via pins 1, 4 and 6. Pin 8 is controlled via TR134 by the fast blanking output (pin 17) from the teletext decoder IC105.

If pins 10, 12 and 15 are high IC108 accepts external RGB signals from the SCART socket AV2 via pins 3, 5 and 7. The switching pins (10, 12, 15) are controlled by pin 16 on the SCART socket. External RGB can only be selected when the receiver is in AV2 mode; in TV or AV1 mode TR132 is turned on, preventing pins 10, 12, 15 from rising.

Pin 9 of IC108 goes high whenever pins 8 (teletext) or 10 (AV2) are hign. This switches the colour decoder (IC111 pin 9) to RGB mode. The RGB signals for on-screen display are added to the output of IC108 via resistors R280, 282, 284.

SECAM DECODER
A module containing a TDA8490 SECAM decoder (IC851) can be fitted in parallel with the PAL decoder (IC111) to process the SECAM chroma signals. The Luma signal passes through the TDA8391 PAL decoder.

The SECAM system transmits colour information as FM modulated colour difference signals. The signals are sequential; (R-Y) for one horizontal line and (B-Y) for the next. To enable the colour difference signals to be identified the (R-Y) signal has a centre frequency of 4·406MHz and the (B-Y) signal 4·25MHz.

The composite video signal from the amplifier stage TR120, TR121 passes through the Bell (cloche) filter to pin 3. The Bell filter (L854) is tuned to approximately 4·4MHz and equalises the amplitude of the two FM signals. C856 prevents most of the Luma signal from reaching L854. The Bell filter will also compensate for frequency response errors in the vision IF stages.

The SECAM signal passes through a limiting amplifier before being demodulated. After black-level clamping and de-emphasis the (R-Y) and (B-Y) signals from pin 11 and 12 pass to the solid state delay line IC113. A Commutating switch is not required because IC113 simply adds the delayed R-Y and B-Y signals to the undelayed signals. As the R-Y and B-Y signals only appear every alternate line, either the delayed and non-delayed signal will be zero at any one time. Adding the delayed and non-delayed signals together will always produce a R-Y or B-Y signal for every line.

An additional notch filter is connected to the Luma input of the TDA8391 PAL decoder. When SECAM is detected, transistor TR851 is turned on, connecting the filter (L851 and C862) to ground. In PAL mode the transistor is off and the trap has no effect.

The SECAM decoder can identify SECAM-V, SECAM-H and non-SECAM signals. Links L851, LK852, LK853 are used to select the SECAM identification. Links on early boards were marked LK800, 801, 802.

LK851 (LK800) selects SECAM-V (vertical/frame identification). This is the early SECAM system still used in parts of Eastern Europe and Africa. LK852 (LK801) selects SECAM-H (horizontal/line identification). This is sometimes called MESCAM and is the most common SECAM system in current use. LK853 (LK802) selects SECAM-V or H automatically but can have identification errors in areas with PAL signals.

The chroma demodulator circuit of the TDA8391 PAL decoder can be switched off by the SECAM decoder. When the TDA8490 detects valid SECAM signals it changes the DC level on the R-Y and B-Y outputs to switch the PAL section off.

On dual standard receivers the PAL and SECAM decoders can be forced into PAL or SECAM mode to prevent identification errors with poor signals.

In PAL only mode (system I/P) transistor TR853 is turned on preventing the SECAM signal from reaching the SECAM decoder. IC851 (TDA8490) will then switch to PAL/NOT SECAM mode.

In SECAM only mode (system 2/S) transistor TR119 is turned on preventing the PAL chroma signal from reaching the PAL decoder. The TDA8391 will then switch to SECAM/ monochrome mode.

The forced PAL/SECAM modes are recommended for system L operation (SECAM only) or in countries where both PAL and SECAM are available. If transistors TR852 and TR853 are omitted then the decoder will select PAL or SECAM automatically.

VIDEO AMPLIFIER
An integrated circuit (IC601) is used for the RGB video output amplifiers on the CRT base.The TEA5101A has three independent channels incorporating an operational amplifier, MOSFET class B (push-pull) output stages and sampling transistors for auto grey-scale (auto cut- off). Flashover protection diodes are also included.

The signal path for the Red channel is as follows:
The Red signal passes through L623 (anti-spook choke) and R609 to pin 4 which is the 'virtual earth' input of the amplifier. The gain of the video stage is set by the feedback resistors R604 and R610. For picture tubes with non standard phosphors it may be necessary to reduce the gain (drive) by fitting RV601 and R623.

Each video amplifier channel has two outputs. Pin 9 is connected directly to the MOSFET output stage. For positive transitions D603 conducts to allow the cathode potential to rise. C602 provides AC coupling for high frequency signals with both positive and negative transistors. Pin 7 is connected via the black level sampling transistor to pin 6 and discharges the cathode potential for negative transitions.

Automatic cut-off (auto grey-scale) is achieved by applying a pulse with a predetermined level to the cathode of the picture tube and turning the black level sampling transistor on.

The pulses occur at the end of the frame flyback period and have an amplitude sufficient to cause each picture tube gun to conduct slightly. The cathode current from pin 6 is used by the TDA8391 PAL decoder to set the clamp levels for each of the RGB outputs.

VOLTAGES

TUNER

Pin 1 (AGC) ..... No signal 9·1V DC – max signal 2·0V

IC001 (TDA4504)
Voltages measured in PAL TV mode unless indicated by [ ]

Pin 6 ..... 5·3V
Pin 8 .....11·5V Vcc
Pin 9 ..... 5·6V
Pin 10 ..... 5·6V
Pin 11 ..... 4·6V (voltage varies with signal)
Pin 12 ..... 5·0V [0V SECAM]
Pin 13 ..... 2·0V/video in
Pin 15 ..... 3·9V/video 2Vpp
Pin 16 ..... 3·2V/video 1.8Vpp
Pin 18 ..... 0V [11V AV]
Pin 20 ..... 3·5V/video 2Vpp
Pin 22 ..... 2·8V
Pin 23 ..... 6·0V/IF 250mVpp
Pin 24 ..... 6.0V/IF 250mVpp
Pin 25 ..... 9·3V
Pin 32 ..... 0V [11·5V SECAM]

IC108 (TEA5114)
Switching and signal levels are typically 1V peak-to-peak.

IC109 (TDA8453)
Voltages measured in PAL TV mode unless indicated by [ ]

Pin 1 ..... 6·3V DC
Pin 2 ..... 4·1V/S-VHS chroma
Pin 3 .....11·9V Vcc
Pin 4 ..... 5·1V/video 1·8Vpp
Pin 5 .....0V [10·7V S-VHS]
Pin 6 ..... 5·1V/Luma 800mVpp
Pin 7 ..... 0V [12V AV2]
Pin 8 ..... 5·1V/Chroma 300mVpp
Pin 9 ..... Ground
Pin10 ..... 8·9V/S-VHS chroma in
Pin11 ..... Ground
Pin12 ..... 4·4V/8·86MHz 350mVpp
Pin13 .....11·3V Vcc
Pin14 ..... 3·4V
Pin 15 .....14·3V
Pin 16 ..... 4·1V/video 1·4Vpp
Pin 17 ..... 3·2V
Pin 18 ..... 4·1V/AV in

IC111 (TDA8391)
Voltages measured in PAL mode unless indicated by [ ]

Pin 1 ..... 6·6V [7·0V no PAL]
Pin 2 ..... 3·8V
Pin 3 ..... 3·5V
Pin 4 ..... 5·2V [2·8V no PAL]
Pin 5 ..... Brightness 1V - 3·3V
Pin 6 ..... Colour 2·2V - 4·2V
Pin 7 ..... Contrast 2·2V - 4·2V
Pin 8 ..... SSC
Pin 9 ..... 0V [1V - 4V RGB]
Pin 10 ..... Varies
Pin 11 ..... 3·9V
Pin 12 ..... 7·5V
Pin 13 ..... R out 6·5Vpp typical
Pin 14 ..... 4·1V
Pin 15 ..... B out 6·5Vpp typical
Pin 16 ..... 4·1V
Pin 17 ..... G out 6·5Vpp typical
Pin 18 ..... 4·1V
Pin 19 ..... 7·4V
Pin 20 ..... 7·7V
Pin 21 ..... 3·0V/R-Y 1Vpp
Pin 22 ..... 3·0V/B-Y 1Vpp
Pin 23 ..... 11·9V Vcc
Pin 24 ..... 4·3V typical
Pin 25 ..... 3·1V/Luma 800mVpp
Pin 26 ..... 8·6V/B-Y 600mVpp [1·3V no PAL]
Pin 27 ..... 8.6V/R-Y 600mVpp [1·3V no PAL]
Pin 28 ..... 8·86MHz 300mVpp
Pin 29 ..... Ground
Pin 30 ..... 2·8V/Chroma 150mVpp
Pin 31 ..... 6·0V [4·2V]
Pin 32 ..... 8·8V

IC113 (TDA8451A)

Pin 1 ..... Ground
Pin 2 ..... Ground
Pin 3 ..... 11·9V Vcc
Pin 4 ..... Ground
Pin 5 ..... 2·3V
Pin 6 ..... Varies
Pin 7 ..... Ground
Pin 8 ..... Varies
Pin 9 ..... 4·3V/R-Y 1Vpp

IC113 (TDA8451A) *continued.*

Pin 10 ..... 4·8V/R-Y 600mVpp

Pin 11 ..... 4·9V/B-Y 600mVpp

Pin 12 ..... 4·3V/B-Y 1Vpp

Pin 13 ..... Varies

Pin 14 ..... 13·7V boost

Pin 15 ..... SSC

Pin 16 ..... 11·3V Vcc

IC851 (TDA8490)
Voltages measured in SECAM mode unless indicated by [ ]

Pin 1 ..... Ground

Pin 2 ..... 2·9V DC

Pin 3 ..... Varies/Chroma 150mV pp
[forced to 0V if TR853 is fitted]

Pin 4 ..... See option link

Pin 5 ..... 9·8V

Pin 6 ..... 8·2V [10·8V PAL or no signal]

Pin 7 ..... SSC

Pin 8 ..... 11·9V

Pin 9 ..... 11·9V

Pin 10 ..... 0·7V [0V PAL or no signal]

Pin 11 ..... 3·6V/B-Y 2Vpp
[8·6V PAL, 1·2V no signal]

Pin 12 ..... 3·7V/R-Y 1·5Vpp
[8·5V PAL, 3·7V no signal]

Pin 13 ..... 4·0V [3·6V PAL or no signal]

Pin 14 ..... 4·1V [3·6V PAL or no signal]

Pin 15 ..... 6·5V

Pin 16 ..... 6·7V

Pin 17 ..... 2·3V

Pin 18 ..... 2·3V

IC601 (TEA5101A)

Pin 1 ..... 3·5V/B 400mVpp

Pin 2 ..... 11·8V Vcc

Pin 3 ..... 3·5V/G 400mVpp

Pin 4 ..... 3·5V/R 400mVpp

Pin 5 ..... 200V Vs

Pin 6 ..... 3·2V

Pin 7 .....136V/R 100Vpp

Pin 8 ..... Ground

Pin 9 .....136V/R 100Vpp

Pin 10 ..... 140V/G 100Vpp

Pin 11 ..... 3·3V

Pin 12 ..... 140V/G 100Vpp

Pin 13 ..... 130V/B 100Vpp

Pin 14 ..... 3.3V

Pin 15 ..... 130V/B 100Vpp

FAULT GUIDE

No picture, dark screen (sound may be muted)

Turn brightness and contrast to maximum. If on-screen display does not appear and screen remains dark see next fault symptom. If on-screen display does not appear but pale raster is visible check IC111, IC601. If on-screen display appears and raster is visible check video path from jungle (check at AV2 pin 19, AV1 pin 19). Also check RGB switching (IC111 pin 9) and beam current limiter voltage to IC111 pin 24 (2-5V). If weak poorly synchronised picture is visible check XL102 and 8·86MHz from IC111 pin 28.

Turn the A1 (screen) potentiometer up - If horizontal line is visible see Section 5. If raster is visible check 12V supplies to IC601 pin 2 and IC111 pin 23. Also check sandcastle pulses to IC111 pin 8 and IC113 pin 15.

Bright white raster

If raster oscillates or reduces to black after a few seconds check D604, IC601, IC111 or for a fault in the black level (dark I) feedback. Also check A1 adjustment. If the raster remains white, check for 200V on IC601 pin 5.

Purple picture (displaced sideways)

Check sandcastle pulse at IC111 pin 8.

No colour

Override colour killer by applying 12V to IC111 pin 6. If colour appears but reference oscillator is off frequency change XL102. If no colour check IC113, IC109. Also check timing of sandcastle pulse to colour burst at pins 8 and 30.

Noise bars on screen

If no colour check XL102 - if colour present check for ripple on 12V supply (IC102 unstable).

Section 7 - Sound IF and Audio

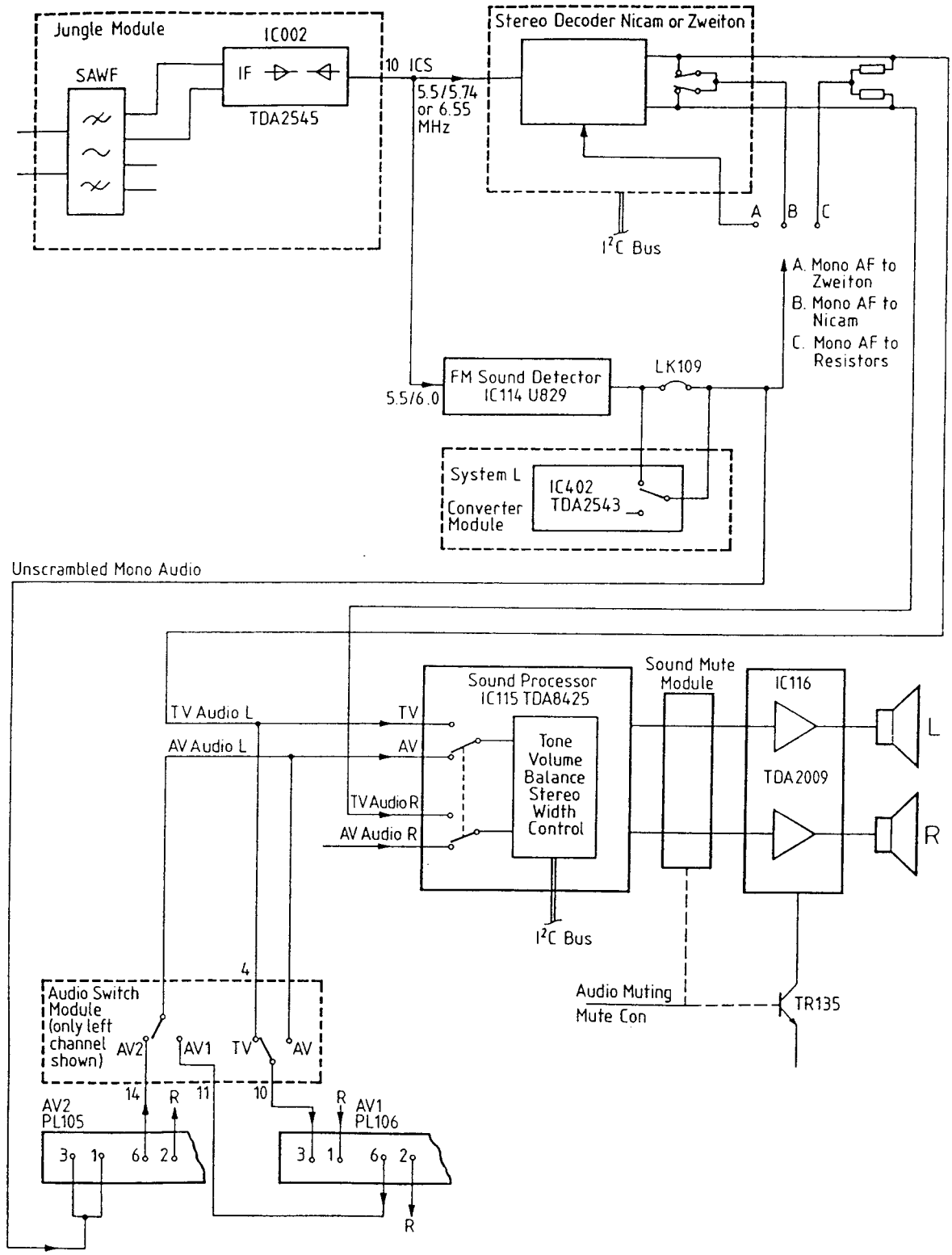


Fig. 7.1. Sound IF and Audio block diagram

CIRCUIT DESCRIPTION

IF STAGES

On stereo models a dual output SAW filter and quasi-parallel sound IF demodulator are used to give the superior signal-to-noise ratio necessary for stereo sound.

The 'sound' output of the SAW filter only contains the sound carriers and the vision carrier. Most of the components of the vision signal are attenuated to reduce intermodulation and vision buzz.

A TDA2545 parallel sound IF (IC002) is used to mix the sound and vision carriers to produce intercarrier sound IF frequencies of 5·5/5·74 6·0/6·552 or 6·5MHz. The TDA2545 is similar to conventional vision IF circuits with gain controlled amplifiers and an AGC detector except that the synchronous detector operates in quadrature mode to eliminate any remaining video components.

For mono sound models IC002 is omitted and the inter-carrier sound obtained from the video signal via link LK001.

The intercarrier sound (ICS) signal from pin 10 of the jungle module passes to the NICAM or ZWEITON decoder module and to the mono FM sound detector IC114 (U829).
NOTE: IC114 is not fitted if a ZWEITON decoder is fitted in a single standard receiver.

The operation of the NICAM and ZWEITON decoders is described in Sections 10 and 11.

FM DEMODULATOR

The U829 detector is a conventional FM IF amplifier/detector which produces a fixed level audio output (MONO FM). After de-emphasis by R250 and C230 the audio passes through the AM detector and switch in the system L converter module (if fitted) or through link LK109 to transistor TR111.

The mono audio from TR111 enters the NICAM or ZWEITON decoder. Resistors R254 and R255 are fitted if the stereo decoder is not used.

AUDIO PROCESSOR

The TDA8425 tone control circuit, IC115, provides control of volume, balance, treble and bass. The circuit also has stereo wide (spatial) and pseudo stereo features together with a source switch and mute circuit. Control of the TDA8425 is by I^2C bus.

When the receiver is in TV mode the source switch accepts the TV (off air) signals via pins 18 (IN1L) and 20 (IN1R).

In AV mode the source switch accepts signals from the audio switch module via pins 1 (IN2L) and 3 (IN2R).

The audio switch module performs two basic switching functions:

The CMOS analog switches in IC901 (pins 1-2 and 4-3) are connected as a 2-way switch which accepts audio from the SCART socket AV1 or AV2. The audio then passes to the tone control IC.

The CMOS analog switches (pins 8-9 and 10-11) are connected as a 2-way switch which supplies audio to the buffer transistor TR902. This ensures that audio from whichever source currently selected (TV/AV1/AV2) is available at the AV1 socket for a video recorder.

IC902 performs the same switching function for the right channel.

SOUND MUTING MODULE (Not on early versions)

The MUTECON pin of the microprocessor (IC117 pin 2) goes high during channel or AV change. This turns the two FET transistors on, grounding the left and right audio lines.

STEREO POWER AMPLIFIER

A TDA2009 amplifier (IC116) is used for the audio output stage. The TDA2009 produces 2 x 8W with 8 ohm speakers and has internal short-circuit and over temperature protection. On early versions without the sound muting module, transistor TR135 is fitted. This is turned on during standby to mute the output stage.

VOLTAGES

IC002 (TDA2545)

Pin 1 ..... 4·6V
Pin 2 ..... 4·6V
Pin 3 ..... 6·6V
Pin 4 ..... nc
Pin 5 ..... nc
Pin 6 ..... nc
Pin 7 ..... nc
Pin 8 ..... 5·5V
Pin 9 ..... 5·5V
Pin 10 ..... Ground
Pin 11 ..... 12V Vcc
Pin 12 ..... 5·9V/ICS 100mVpp
Pin 13 ..... nc
Pin 14 ..... nc
Pin 15 ..... 4·6V
Pin 16 ..... 4·6V

IC114 (U829)

Pin 1 ..... 2·2V
Pin 2 ..... 2·2V
Pin 3 ..... Ground
Pin 4 ..... 2·2V
Pin 5 ..... 3·1V
Pin 6 ..... 3·1V
Pin 7 ..... 11·8V Vcc
Pin 8 ..... 3·5V/AF 2Vpp

IC115 (TDA8425)

Pin1 ..... 6·0V/AF-IN
Pin 2 ..... 11·9V
Pin 3 ..... 6·0/AF-IN
Pin 4 ..... 12V Vcc
Pin 5 ..... Ground
Pin 6 ..... 6·0V
Pin 7 ..... 6·0V
Pin 8 ..... 6·0V
Pin 9 ..... 6·0V/AF-R
Pin 10 ..... Ground
Pin 11 ..... I^2C data
Pin 12 ..... I^2C clock
Pin 13 ..... 6·0V/AF-L
Pin 14 ..... 6·0V
Pin 15 ..... 6.0V
Pin 16 ..... 6.0V
Pin 17 ..... 6·0V
Pin 18 ..... 6.0V/AF-IN
Pin 19 ..... 6·0V
Pin 20 ..... 6·0V/AF-IN

IC901, IC902 (on Audio Switch module)

The DC bias voltage on the analog switches is supplied by pins 1 and 3 of IC115. This is typically 5 - 7V

IC116 (TDA2009)

Pin1 ..... 1·4V
Pin 2 ..... 0·8V
Pin 3 ..... 14·6V
Pin 4 ..... 0·8V
Pin 5 ..... 1·4V
Pin 6 ..... Ground
Pin 7 ..... nc
Pin 8 ..... 13V
Pin 9 ..... 27V Vcc
Pin 10 ..... 13V
Pin 11 ..... 1·5V

ALIGNMENT - See Section 4

FAULT GUIDE

No sound
Check for sound (audio) on pin 1 of the SCART sockets AV1, AV2 - If sound OK then check output from IC115, sound mute module, TR135 (if fitted) and IC116. Also check muting mode. If no AV sound then check next fault symptoms.

No sound from AV2
Check IC114, IC401 and system switching (system L), IC002.

No sound from AV1 (AV2 OK)
Check audio switch module, stereo (NICAM/ZWEITON) decoder.

Sound muting
Sound muting may occur in IC115, the sound mute module or TR135 (if fitted) -check ident to IC117 pin 29 (5V-TV). Check for I^2C bus faults (text co-processor crystal, ZWEITON decoder crystal).

Sound distorted/weak
Check C908, C910, IC901, IC902 on audio switch board. Also check IC115, TR135 (if fitted).

Incorrect sound switching
Check IC901, IC902, IC115, PCB tracks on audio switchboard.

Section 8 - Tuning and Control

CIRCUIT DESCRIPTION

CONTROL MICROPROCESSOR (IC117)

A PCA84C640 CMOS microprocessor is used to perform many of the control functions in the receiver.

It provides:

- Voltage synthesised tuning with storage of up to 70 stations.
- Automatic search (sweep tune).
- Analog outputs for brightness, contrast and colour.
- Control of audio processing via I^2C bus.
- Normalised (ideal) levels can be preset to a preferred level.
- Control of NICAM or ZWEITON stereo decoders.
- SCART/AV switching.
- On-screen display of station (programme) number, tuning scale, band switch and analogue levels.
- Control of the basic functions of the teletext decoder.
- Decoding of remote control commands.
- Sleep timer and automatic standby timer.

A non-volatile EEPROM (IC112) is used to store the data for tuning, bandswitch, language and customer settings. Communication is via a 2-wire I^2C bus.

POWER ON RESET

The initialisation of the microprocessor occurs in several stages. When the 5VSTBY supply is applied, an internal transistor is switched on which grounds the reset pin, preventing C263 from charging. Once the supply voltage (Vdd) has reached 1·5V the transistor is turned off and C263 charges and resets the microprocessor. The strobe line (pin 13) now goes low and the diode matrix is scanned (diodes D127-D132). The input ports are then scanned to detect the option links and the I^2C bus interrogated to test for the presence of the Fastext or Toptext co-processors and the NICAM or ZWEITON stereo decoders. These stages set the operating system.

STANDBY ON/OFF

The standby port (pin 41) is controlled by commands for standby, ON and sleep timer. A transition on pin 8 of SCART socket AV1 also controls this pin.

In standby mode pin 41 is high turning transistors TR133 on and TR127, TR130 off. This switches the 12V supply off preventing the line (horizontal) oscillator and output stages from operating. On early versions the standby pin also turns the transistor TR135 on to mute the audio output amplifier.

The 5V supply (5VSTBY) to the microprocessor and infra-red receiver is maintained during standby to allow the receiver to be brought out of standby.

KEYBOARD

Depending on the cabinet style, a 4 key or 14 key control panel (keyboard) may be fitted.

The keyboard switches are scanned by pins 13-19. These pins have bi-directional input and output ports which can detect the closed contact of a keyboard switch. The switches are connected between the matrix lines or from a matrix line to the ground.

ANALOGUE OUTPUTS

Pins 3, 4 and 5 produce variable width pulses of 5V amplitude which are filtered by the RC networks C267/R310 etc. to produce the DC control voltages for brightness, colour and contrast.

The mid-point voltages are set by the potential dividers R315, R210 etc.

AUDIO CONTROL

The microprocessor controls the TDA8425 audio processor circuit, IC115, as well as the NICAM or ZWEITON decoder. Communication is via the I^2C bus.

Pin 2 also controls the sound mute module (high to mute sound).

BAND SWITCHING

Transistors are used to buffer the band switch pins (7, 8 and 11).

Pins 7 and 8 also have input ports which can sense the presence of option links. If UHF only operation is required then these pins can be grounded. The microprocessor will then ignore any request for the VHF operation and will not display the band information.

TUNING VOLTAGE

Pulses of variable width from pin 1 drive the switching transistor TR126. The waveform at the collector (33V peak square wave) is averaged and filtered by an RC network to produce the DC tuning voltage.

AFC

The AFC signal from pin 1 (SAVAFC) of the jungle module is applied via a potential divider to pin 9 of the microprocessor.

Resistors R347, R192 and R307 form the potential divider which reduces the AFC voltage swing from 0-12V to a maximum of 5V.

Pin 9 is normally at 2·5-2·9V when there is no tuning error. If tuning drift occurs, pin 9 will be driven high or low and the microprocessor will change the data for the D-A tuning voltage converter (pin 1) by one bit at a time until there is no AFC error. In this way the tuning system can track the signal over a very large range.

The microprocessor only responds to the AFC voltage at pin 9 if the TV ident line is high. If the TV ident signal is low (no TV signal) or fine tune has been used (denoted by X after programme number) the microprocessor will ignore pin 9.

TV IDENTIFICATION (TV Ident)

The TDA4504 integrated circuit in the jungle module has a coincidence detector which detects the presence of a TV signal. The ident signal from pin 5 (SAVCOJUN) of the jungle module is applied to pin 29 of the microprocessor via the potential divider resistors R220 and R287 to control search tuning and sound muting. (Sound muting occurs in the audio processor IC115).

If a valid TV signal is detected the ident signal at pin 5 (SAVCOJUN) rises to 12V and pin 29 (IC117) to 5V. For 525-line M/N signals the ident is 9V and 3·7V respectively.

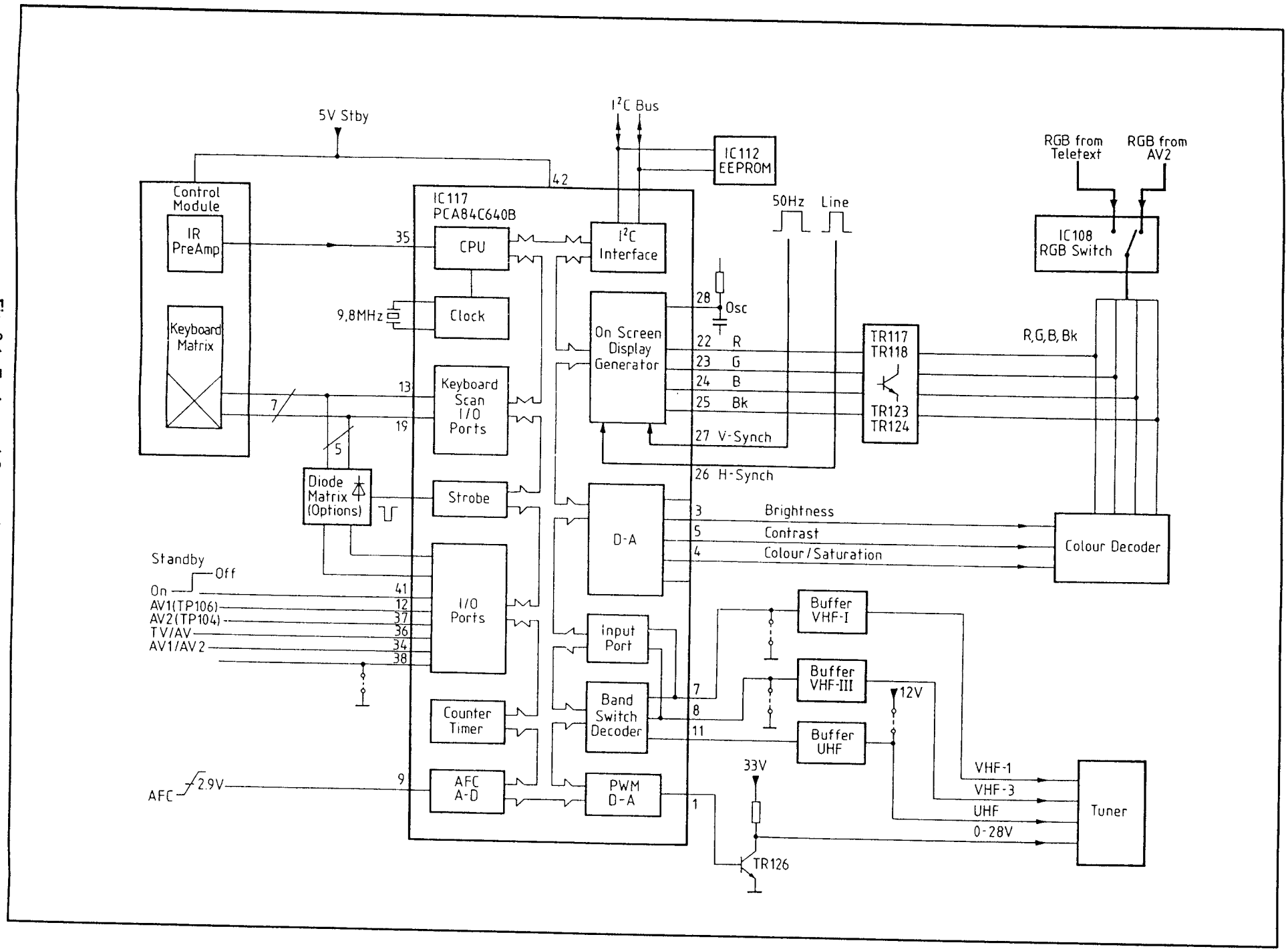


Fig. 6.1. Tuning and Control block diagram

SEARCH TUNE
During search (sweep) tune the tuning voltage (0-28V) is steadily increased. As soon as a TV signal is received the TV ident line goes high and the tuning rate slows to a series of small steps. When the AFC signal begins to change the tuning rate slows further and increments up or down in steps of 1 bit until the AFC voltage is centred on 6V.

ON SCREEN DISPLAY
An RC oscillator at pin 28 of the microprocessor is used to drive the pixel generator. The oscillator operates in bursts of approximately 10MHz; the size and position of the 'on-screen display' characters affect the timing and duration of each burst.

Vertical and horizontal synchronization pulses are required to reset the counters in the display generator. The vertical sync pulse at pin 27 is obtained from the vertical (frame) output stage via the pulse shaping network D124, R219, R326. The horizontal sync pulse at pin 26 is obtained from the flyback pulse via R182.

The RGB signals for on-screen display pass through transistors TR117, 118 and TR123, 124 to the colour decoder.

AV (SCART)
The SCART sockets AV1 and AV2 are controlled by the microprocessor and can be selected with a remote control command or, in later versions, by a voltage on pin 8 of each SCART socket.

AV1 is intended for use with a video recorder.

The microprocessor responds to voltage transitions on pin 8 of AV1 rather than the DC levels. This is necessary because some VCRs produce a switching potential on pin 8 whenever they are on, irrespective of record or playback mode. If the microprocessor responded to DC levels it would be forced into AV mode as soon as the VCR is connected. By responding only to transitions it will ignore any VCR that produces a continuous high switching potential. In this case Pin 8 will also control the standby (on/off) switching. If the receiver is in standby and the VCR switched to play (voltage on pin 8 rises) then the receiver will come out of standby.

AV2 can be configured in two different ways:
In AUX (auxiliary) mode the AV2 socket only responds to the transitions.

If the DEC (decoder) mode is selected the microprocessor responds to the DC level and will revert to TV operation once pin 8 goes low. This mode is for Canal Plus and other decoders.

See the section on basic operation for selecting AUX or DEC modes.

INFRARED PREAMPLIFIER
The preamplifier module (IC951) consists of an infrared PIN photodiode, wideband amplifier and a carrier mode PCM detector. The detector and filter components are integrated within the module and are not adjustable.

REMOTE CONTROL
The SAA3008 IC transmits RECS80 commands encoded in a pulse position format at a carrier frequency of 38KHz. To provide immunity against interference the data words are transmitted twice, once when the key is pressed and again when the key is released. When not transmitting, the current consumption is kept to a minimum by the use of LOCMOS technology.

TELETEXT CONTROL
The current versions of the microprocessor control the basic functions of the teletext decoder via the I^2C bus. A dedicated 'slave' microprocessor (co-processor) is necessary to provide the additional data processing and features necessary for Fastext or Toptext.

Future software versions may not require the additional processor.

FAULT GUIDE

NOTE: Faults in components connected to the I^2C bus can cause symptoms in other areas. As an example, a fault in the NICAM decoder (IC501) can cause tuning problems or incorrect programme numbers. If the fault cannot be identified using the guide, disconnect each component or module on the I^2C bus in turn.

In standby (LED not lit or dim)
Check 5V supply and crystal XL103 (remove C261, 262 if fitted).

Locked in standby (LED lit)
C263 short, R295 open.

Comes out of standby but no picture or other function
I^2C bus line pulled down or shorted.

Not tuning
IC117, TR126.

Search tune not stopping (use fine tune keys to tune to signal)
If picture and sound OK, check that AFC to IC117 pin 9 varies with tuning (0-5V).
If picture OK but sound muted check ident to IC117 pin 29 (5V -TV, 0V - no TV).
If no sync see fault guide in Section 5.
If AFC pulls off-station check AFC polarity (IC001 pin 12 high).

Tuning not memorised
IC112, C266 short, R320 open.

No remote control operation
Check IC951, C951, IC117.

No on-screen display
If RGB and blanking from IC117 pins 22-25 are OK then check IC108 and IC111.
If no RGB then check V sync at IC117 pin 27 and H sync at pin 26 (D109, D123, D124).
If sync is OK check C260, R288, IC117.

No sound (muted)
Check ident to IC117 pin 29.
Check text sandcastle to text co-processor (IC701 pin 13 or IC720 pin 10).

Section 9 - Teletext

CIRCUIT DESCRIPTION

The teletext decoder uses an SAA5231 VIP video processor circuit for data recovery and clock generators together with an SAA5243 ECCT computer controlled text circuit for multi-language teletext decoding and character generator. A 64K SRAM is used for page store.

The basic functions of the teletext decoder are controlled by the tuning and control microprocessor (IC117) via the I^2C bus.

For 'full level one features' (FLOF) teletext systems such as Fastext, Toptext or Packet X26, additional processing power must be provided by a slave microprocessor (text co-processor) which is fitted on the teletext expansion module. There are several different co-processors available each with a mask programmed RAM for different text systems.

NOTE: With current software, the teletext decoder will not operate without a co-processor. Future software versions of the control microprocessor may have sufficient capacity to decode Fastext signals without the need for a co-processor.

DATA DECODING AND PAGE DISPLAY

Composite video (FBAS) enters the SAA5231 VIP circuit (IC110) at pin 27 where the sync separator extracts the teletext data pulses and TV synchronising pulses.

The teletext data pulses from the sync separator (output B) pass through an amplifier and a high frequency boost circuit (pins 3 and 4) before being sliced by the data slicer. The clock regenerator circuit synchronises the crystal controlled oscillator at pin 11 (XL101) to the data pulses which have a clock frequency of 6·9375MHz. The regenerated teletext clock (TTC) signal is used to drive the latch circuit which restores the correct amplitude and pulse width to the teletext data (TTD) pulses. These leave IC110 at pin 15.

The 6·9375 MHz TTC clock signal from pin 14 is also used to drive the data acquisition circuit within the CCT decoder IC105.

The data acquisition circuit converts the text data pulses which are in serial form to an 8-bit parallel data byte which then enters the memory interface circuit. When data corresponding to the page number requested (plus the three additional or linked pages) is received, the data is transferred to the SRAM IC104.

When a teletext page is to be displayed, the memory controller reads the relevant data in the SRAM and transfers it to the character generator.

TIMING AND SYNCHRONISATION

The timing circuit in the SAA5243 CCT (IC105) generates all the timing signals required for data acquisition and decoding, pixel frequency for the character generator, memory controller and interlace.

For correct decoding and stable display, the 6MHz master clock generator in IC110 must be locked to the TV signal. The phase detector and 6MHz oscillator together with the divider within the timing circuit of IC105 form a PLL circuit.

The TV synchronising pulses (VCS) from the sync separator (point A in IC110) enter the phase detector where they are compared with the 15625Hz sandcastle pulse generated by the timing circuit in IC105 (pin 11). The output of the phase detector then controls the frequency of the 6MHz clock. The line (horizontal) and frame (Vertical) sync pulses in the VCS signal are also used to reset the line and frame counters in the timing circuit (IC105 pin 10).

Noise in the line oscillator and 6MHz timing oscillator circuits is often visible as a random horizontal displacement. To reduce this effect the television is synchronised to the TCS signal rather than the video signal when the decoder is in full page text mode. (source switch to sync from point A, sync switch to TCS from pin 28).

In mixed text mode the text display must be synchronised to the picture to ensure that the text and the picture are centred correctly. The source switch remains in the TCS (pin 28) position, however the sync switch now accepts the sync signals from point B.

The Teletext sandcastle pulse (TSSC) signal can be used to indicate the quality of the video signal applied to the text decoder.

If the video signal is not present or is very weak the 6MHz clock oscillator will not lock correctly and the source switch is switched to the TCS (after hours sync) signal. This keeps the 6MHz PLL loop closed giving a stable display.

The TTSC signal is also sliced by transistor TR701 on the Fastext expansion module and its output (good/bad) applied to pin 13 of IC701 (TR720 and IC720 pin 10 for Toptext versions). The control microprocessor can interrogate the slave co-processor via the I^2C bus and use the good/bad signal for sound muting.

RGB SWITCHING

The TEA5114 RGB switch (IC108) is used to switch between the RGB signals from the SCART socket AV2 or teletext. In text mode the fast blanking output (IC105 pin 17) is high, turning TR134 on and driving pin 8 of IC108 high.

The text RGB signals enter IC108 at pins 1, 4 and 6.

FITTING AND REMOVAL

See options list in circuit diagram.

The decoder can be disconnected for fault finding by refitting link LK108 to restore the synchronisation signal and removing TR134 to disable the RGB switch.

SYSTEM OPTIONS

1. FASTEXT (UK and most of Europe) IC105 SAA5243EM2, IC701 MAB8461-W172 (6MHz) - IC701 is fitted on the Fastext expansion board
2. PACKET X26 (Spain) IC105 SAA5243EM2, IC701 PCF84C81-CTV972S (9·8 MHz)
3. PACKET X26 (Turkey) IC105 SAA5243T, IC701 PCF84C81-CTV974S (9·8 MHz)
4. PACKET X 26 (Israel) IC105 SAA5243L, IC701 PCF84C81-CTV973S (9·8 MHz)
5. TOPTEXT (Germany and Spain), IC105 SAA5243EM2. IC720 PCB83C654PO13 (12MHz) - IC720 is fitted on the Toptext expansion board.

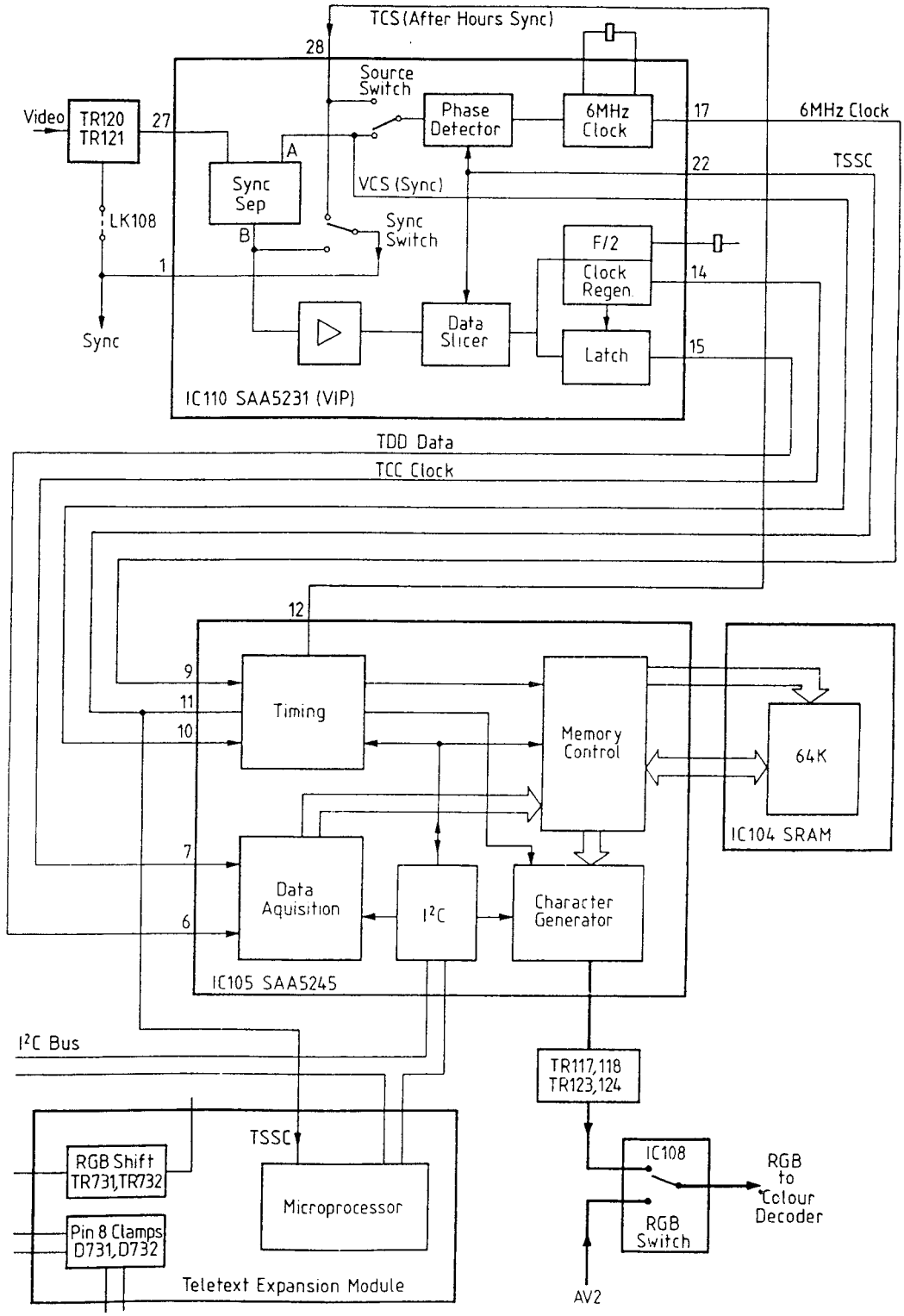


Fig. 9.1. Teletext block diagram

ALIGNMENT

See section 4

FAULT GUIDE

Faults in the Fastext or Toptext expansion module can cause random teletext operation. This may appear as an intermittent headline, intermittent rolling, no text, no Fastext/Toptext, no picture, intermittent page numbers and so on. The fault guide is for the standard teletext decoder section.

NOTE: The Teletext decoder will not operate without a Fastext or Toptext expansion module.

No picture or text

Check IC105, IC108.

No text (blank raster)

Check IC108, IC104.

No text

If page number appears check XL101, C171, C183, C185, C186, C187, C189.
If page number is not stable then check video to IC110 pin 27, XL100, C290 alignment, C176 short, R129 open and IC110.

Text display has no horizontal sync

Check clock frequency alignment (C290)
Check C173, C174, C179, C180 for short-circuit and XL100.

Severe corruption (errors)

Enter new page number. If the requested page number has errors check IC104, IC105 (data bus lines).
If page number is OK but other characters are corrupted check the IF alignment or C188 short.

Corruption (random errors)

Check IF alignment, (CL290). Also check C190 and L105.

Page number error (selects different page number to that requested)

Check IC104, IC105 (address bus lines).

EXPANSION MODULE

Random faults or no text

Check XL701, C701 open, C702, C703 short, D703 short,
NOTE: Toptext components are: XL720, C720, C721, C722, R721.

Section 10 - NICAM Decoder

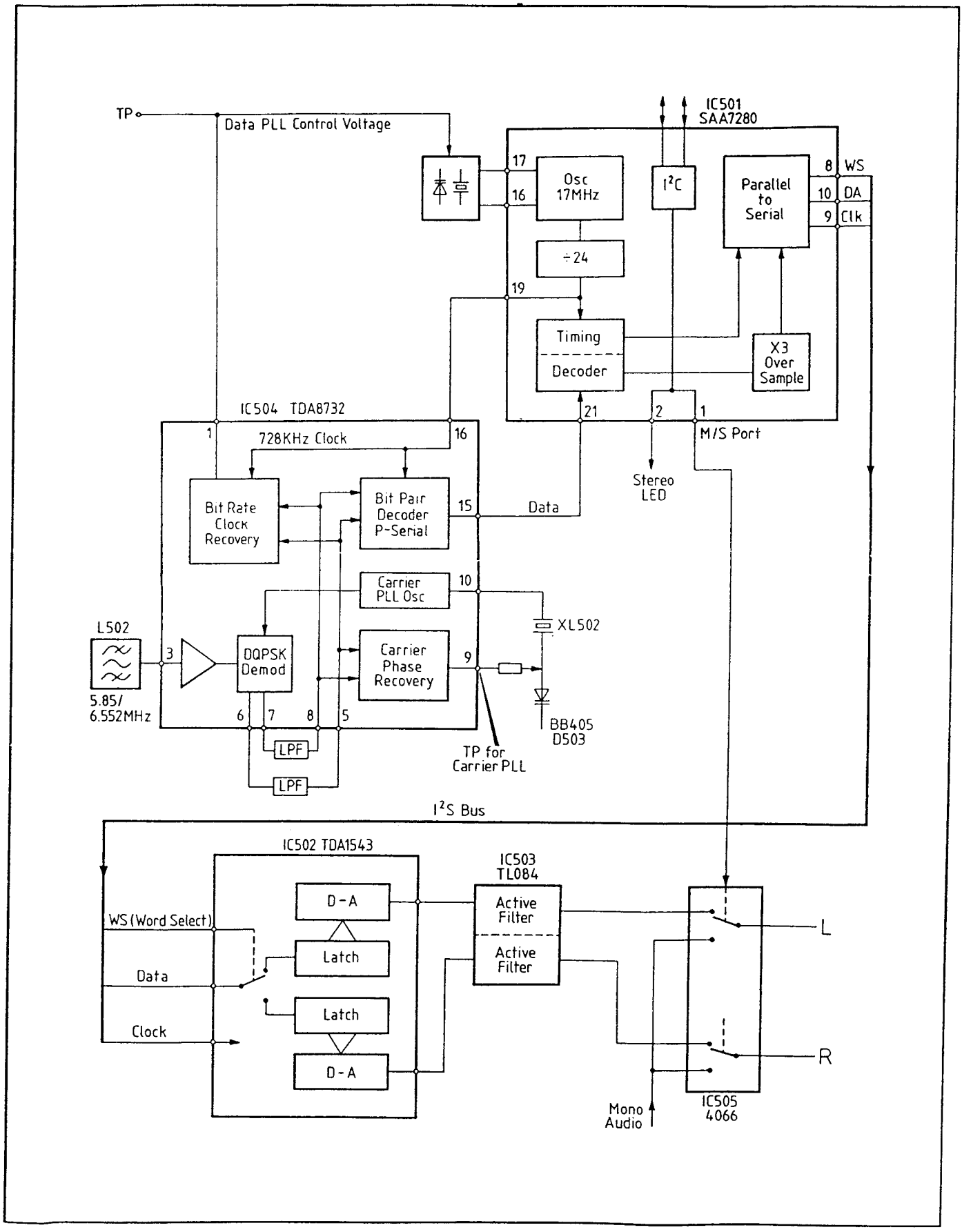


Fig. 10.1. NICAM Decoder block diagram

DESCRIPTION

The Nicam signal is generated by sampling the two audio signals (Left and Right or language A and B) at a frequency of 32kHz. The 14-bit digital words produced by the A-D converter are then compressed to 10 bits to reduce the bandwidth required for transmission.

The 10-bit words are then interleaved for error correction and status; framing codes and additional error correction are added. Finally the digital word is then phase shift modulated by a DQPSK (differentially coded quadrature phase shift key) modulator.

This produces a single carrier of 5·85MHz (system B/G) or 6·552 MHz (system I).

Decoding of the NICAM signal occurs in 7 stages:

- Demodulation of the 5·85 or 6·55 MHz signal by the carrier PLL circuit to produce bit pair data.
- Regeneration of the 728 kHz data clock.
- Differential decoding of the bit pair data and conversion into serial data.
- Decoding of the serial data, expanding to 14-bit words and error checking or correction.
- Digital filtering by x3 oversampling and conversion into I^2S format.
- D - A conversion in a latched serial digital to analog converter.
- Filtering of the analog signals.

CARRIER DEMODULATION

This takes place within the NIDEM IC TDA8732 (IC504). The NICAM signal at 5·85 or 6·552 MHz passes through the block filter L502 to pin 3 where it is limited to remove noise and AM components. The LC block filter also incorporates a 5·5 or 6·0 MHz FM sound trap.

The NICAM DQPSK signal is then demodulated by a Costas PLL circuit. This operates in a similar way to the PLL circuit in many PAL colour decoders where the crystal oscillator runs at twice the carrier frequency and is divided to give two signals with a 90 degree phase difference.

The demodulator block produces two outputs from pins 6 and 7 which must be filtered by the low pass filters L503 and L504 to remove second order harmonics. The 'clean' 364kHz bit pair signals from the filters pass to the carrier phase recovery block which produces an error voltage from pin 9 to control the frequency of the carrier oscillator.

CLOCK REGENERATION

The data clock is regenerated from the bit pair signals by the second PLL circuit. This consists of a bit rate recovery circuit in IC504 and a voltage controlled crystal oscillator in IC501.

The bit rate recovery circuit acts as a phase detector comparing the bit pair signals from the first PLL with the clock frequency from the 17·4MHz oscillator and divider.

The error voltage produced in IC504 pin 1 is used to control the frequency of the oscillator. The output of the oscillator is divided by 24 to give the 728KHz clock for decoding and timing functions.

DECODING OF BIT PAIR SIGNALS

The bit pair outputs from the carrier PLL pass to the decoder block where they are differentially decoded and converted to serial data. The data at pin 15 of IC504 contains the 10-bit NICAM words.

DIGITAL SOUND DECODING

This takes place within IC501 (SAA7280). The NICAM data words from IC504 enter at pin 21 and are corrected for errors before being de-interleaved and expanded to 14 bits.

After passing through the x3 oversampling circuit which acts as a digital filter, the 14-bit words are converted into serial form. (I^2S bus output from pins 8, 9, 10)

D-A CONVERSION

The I^2S bus has 3 lines - clock (SCLK), word select (WS) and data.

The data for the left and right channel is sent sequentially. The word select line instructs the D-A converter (IC502) to steer the data into the left channel or right channel data latches as appropriate.

After D-A conversion an active filter (IC503) with a sharp cut-off is used to remove the switching and aliasing noise from the audio signals.

The CMOS analog switch (IC505) is used for mono (external audio) and stereo switching.

I^2C BUS CONTROL

The NICAM decoder does not control the stereo LED and mono/stereo switching directly. The decoder uses the I^2C bus to inform the control microprocessor of the status or type of signal being received (mono/stereo/dual/data). The microprocessor then instructs the NICAM decoder (IC501) to select the appropriate decoding and to switch the mono/stereo and LED ports on or off.

OPERATING MODES

Mono FM (No NICAM)

Carrier PLL control voltage (IC504 pin 9) high
No audio output from the D - A converter IC502
Mono/stereo switch port (IC501 pin 1) low, turning the audio switch (IC505) to FM mono mode.
LED control port (IC501 pin 2) high, turning the 'stereo' LED off

Stereo NICAM (Stereo mode)

Carrier and data PLLs locked (centre voltage)
Stereo audio output from the D - A converter
Mono/stereo switch port high turning the audio switch to stereo mode
LED control port is low turning the stereo LED on

Stereo NICAM (Mono selected)

The decoder remains in stereo mode with stereo audio from the D - A converter
Mono/stereo switch port is low turning the audio switch to FM mono mode
LED control port is low turning the stereo LED on (see page 3 note on software differences)

OPERATING MODES *continued*

Dual language NICAM (Language 1 - FM channel)
Carrier and data PLLs locked
NICAM channel B from both L and R outputs of the D - A converter
Mono/stereo switch port is low turning the audio switch to FM mono mode
LED control port is low turning the 'stereo' LED on
(See note on software below)

Dual language NICAM (Language 2 - NICAM channel A)
Carrier and data PLLs locked
NICAM channel A from L and R outputs of the D - A converter
Mono/stereo switch port is high turning the audio switch to stereo mode
LED control port is low turning the 'stereo' LED on
(See note on software below)

Dual language NICAM (Language 3 - NICAM channel B)
As above but NICAM channel B from the L and R outputs of the D - A converter

Mono NICAM (1 channel of audio, 1 of data)
The decoder will switch to FM mono mode on channel change
Carrier and data PLLs locked
NICAM channel A from the L and R outputs of the D - A converter
Mono/stereo switch port is high for FM mono mode
LED control port is high turning the 'stereo' LED off

Selecting the second sound mode will turn the audio switch to 'STEREO' mode for NICAM audio

NICAM data (Both channels contain data)
Carrier and data PLLs locked
No output from the D - A converter
Mono/stereo switch port low for FM mono mode
Stereo LED off

NOTE: With 040 and 045 software versions the stereo LED remains on whenever a NICAM signal is received. With later software the LED is only on for NICAM stereo and on-screen display is used to indicate other modes.

FITTING AND REMOVAL
The control microprocessor IC117 can recognise the presence of the NICAM decoder via the I²C bus and selects the correct control mode automatically.

Delete resistors R254, R255 and fit a STEREO jungle module (with IC002/TDA2545). The mono FM sound detector IC114 (U829) is required for NICAM receivers.

ALIGNMENT

Equipment required:
Oscilloscope 5MHz
Oscilloscope probe x10
Ceramic alignment tool

IMPORTANT For correct alignment the carrier and data clock frequencies of the NICAM signal must be accurate to about 0·5Hz

The alignment should be performed using off-air (TV broadcast) signals rather than using a NICAM generator which may not have the required stability.

CARRIER FILTER BLOCK L502
This is pre-aligned and must not be adjusted.

CARRIER PLL FREQUENCY CHECK
NOTE: No adjustment is required unless the PLL control voltage is out of range.

Tune a NICAM stereo or dual language signal. Connect the oscilloscope (100mV/div 0.5ms/div) to pin 9 of IC504 (TDA8732)

The oscilloscope trace should be within the range of +1·5 to +3·5V. If the PLL voltage is low, increase the value of C530. If the PLL voltage is high, decrease the value of C530.

The PLL voltage will rise to 4·5-5V if no NICAM signal is received.

DATA CLOCK PLL
Connect the oscilloscope (100mV/div DC coupled, 0·5ms/div) to pin 1 of IC 504 (SAA7280). Adjust the trimmer capacitor, C544, until the PLL starts to oscillate and note the minimum and maximum levels displayed on the oscilloscope. Adjust C544 to set the PLL voltage to the centre of its range (typically 2·5V).

VOLTAGES

All voltages except those in [ ] are measured with a stereo NICAM signal

IC501 (SAA7280)

Pin 1 ..... 4·9V [0V]
Pin 2 ..... 0V [4.9V]
Pin 3 ..... 5V
Pin 4 ..... 5V Vcc
Pin 5 ..... 5V
Pin 6 ..... 5V
Pin 7 ..... Ground
Pin 8 ..... 2·5V/98kHz square-wave
Pin 9 ..... 2·4V/2·9MHz square-wave
Pin 10 ..... 2.5V/data [0V]
Pin 11 ..... Ground
Pin 12 ..... Ground
Pin 13 ..... 0V
Pin 14 ..... 0V
Pin 15 ..... 4·9V
Pin 16 ..... 2·4V/17mHz
Pin 17 ..... Oscillates when measured
Pin 18 ..... 5V Vcc
Pin 19 ..... 2·5V/728kHz clock
Pin 20 ..... 0V [2·5V/data]
Pin 21 ..... 2·2V/data [1·4V/data]
Pin 22 ..... Fluctuating [0V]
Pin 23 ..... 4·9V [0V]
Pin 24 ..... I²C data
Pin 25 ..... Ground
Pin 26 ..... I²C clock
Pin 27 ..... 0V
Pin 28 ..... 0V

IC502 (TDA1543)

Pin 1 ..... 2·4V/clock 3mHz 5Vpp
Pin 2 ..... 2·5V/WS 97kHz [2.5V]
Pin 3 ..... 2·5V/data [0V]
Pin 4 ..... Ground
Pin 5 ..... 4·9V Vcc
Pin 6 ..... 2·1V/AF - L 200mVpp
Pin 7 ..... 2·2V/noise
Pin 8 ..... 2·1V/AF - R 200mVpp

IC503 (TL084)

Pin 1 ..... 6·2V/AF 1Vpp
Pin 2 ..... 6·2V/AF 1Vpp
Pin 3 ..... 6·2V/AF 1Vpp
Pin 4 ..... 11·8V Vcc
Pin 5 ..... 2·2V/AF 200mVpp
Pin 6 ..... 2·1V/AF 200mVpp
Pin 7 ..... 6·2V/AF 1Vpp
Pin 8 ..... 6·2V/AF 1Vpp
Pin 9 ..... 2·1V/AF 200mVpp
Pin 10 ..... 2·2V/AF 200mVpp
Pin 11 ..... Ground
Pin 12 ..... 6·2V/AF 1Vpp
Pin 13 ..... 6·2V/AF 1Vpp
Pin 14 ..... 6·2V/AF 1Vpp

IC504 (TDA8732)

Pin 1 ..... 2·5V typ [2·5V fluct]
Pin 2 ..... Ground
Pin 3 ..... 2·3V/5·85 or 6·55 MHz
Pin 4 ..... 4·9V Vcc
Pin 5 ..... 3·5V/bit pair 0·7Vpp [3·5V/noise]
Pin 6 ..... 3·7V/bit pair 1Vpp
Pin 7 ..... 3·7V/bit pair 1Vpp
Pin 8 ..... 3·5V/bit pair 0·7Vpp [3·5V/noise]
Pin 9 ..... 3·2V/24kHz ripple [4·9V noise]
Pin 10 ..... 1·8V/11·7-13MHz 200mVpp
Pin 11 ..... 3·9V/sawtooth
Pin 12 ..... 5V Vcc
Pin 13 ..... 3·9V/sawtooth
Pin 14 ..... Ground
Pin 15 ..... 2·2V/data 4Vpp [3·1V/data]
Pin 16 ..... 2·5V/728kHz clock
Pin 17 ..... 0·2V/clock noise
Pin 18 ..... 0·2V/clock noise
Pin 19 ..... Ground
Pin 20 ..... 1·8V/clock noise

IC505 (4066)

Pin 1 ..... 0·3V/EXT-AF [5·9V/EXT-AF]
Pin 2 ..... 5·9V/AF-L 1Vpp
Pin 3 ..... 5·9V/AF-L 1Vpp
Pin 4 ..... 5·9V/AF-L [noise]
Pin 5 ..... 11·7V [0V]
Pin 6 ..... 11·7V [0V]
Pin 7 ..... Ground
Pin 8 ..... 5·9V/AF-R [noise]
Pin 9 ..... 5·9V/AF-R
Pin 10 ..... 5·9V/AF-R
Pin 11 ..... 0·3V [5·9V]
Pin 12 ..... 0V [9·8V]
Pin 13 ..... 0V [9·8V]
Pin 14 ..... 11·8V Vcc

FAULT GUIDE

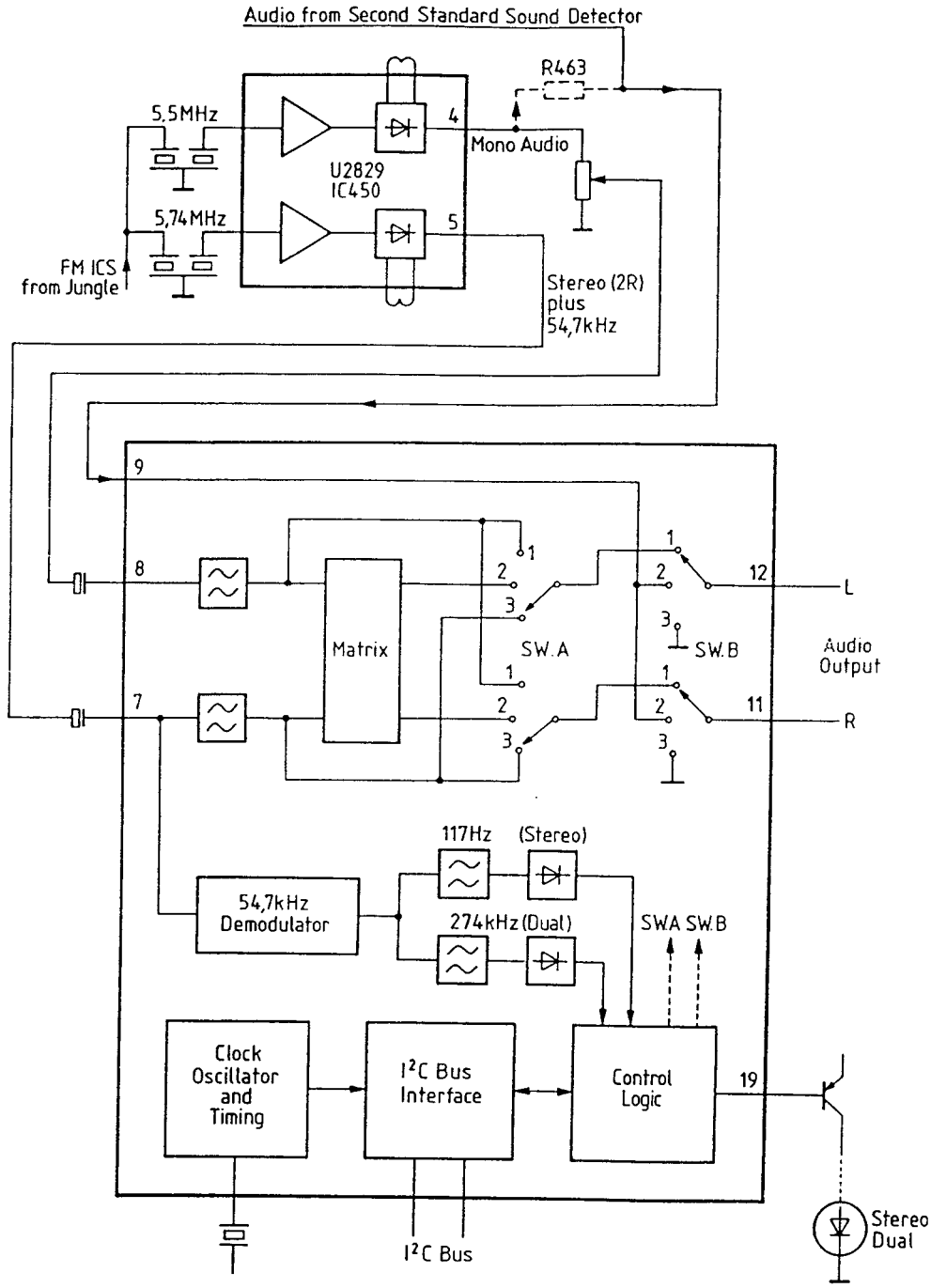
No picture or control functions (stereo LED remains on or OSD shows stereo)
Check crystal XL501, IC501.

No NICAM operation (LED or OSD shows no NICAM)
Carrier PLL not locked (see alignment).
Data PLL not locked (see alignment).
Check XL502, IC501, IC504.

No NICAM (LED on or OSD shows NICAM)
Check audio output of IC502 D-A (pins 6, 8) - if no output check IC502, IC501 - If output present check IC503, IC505.

Oscillating between mono and NICAM
Check alignment of C544 (data PLL).

Section 11 - ZWEITON Decoder



Switch Function

SW.A 1. Dual Language Channel I/Mono
2. Stereo
3. Dual Language Channel II

SW.B 1. Stereo/Dual/Mono Internal
2. Mono External
3. Mute

Fig. 11.1. ZWEITON Decoder block diagram

DESCRIPTION

The Zweiton system uses two FM carriers to transmit stereo or dual language sound.

To ensure compatibility with existing mono receivers, the 5·5MHz carrier is still used to transmit the mono (L+R) signal. The second carrier (5·742MHz) carries the right (R) channel or second language and a 54·7kHz subcarrier with identification tones.

The 5·5 and 5·742MHz carriers are demodulated by a dual FM sound detector IC450 (U2829).

The detected audio signals enter the decoder (IC452) at pin 8 (mono or channel 1) and at pin 7 (Right or channel II). After passing through low pass filters the signals are fed to the stereo matrix to separate the left(L) and right (R) signals, or to the mode switch SW. A for mono or dual language.

To identify stereo or dual language transmissions, the 54·687kHz subcarrier is modulated with a 117·4Hz tone for stereo or a 274·1Hz tone for dual language. The subcarrier on the right (R) audio signal at pin 7 of IC452 is demodulated after passing through a 54·7kHz band pass filter. The output of the demodulator is then fed to two detector circuits which detect the presence of the 117 or 274Hz tones. If a stereo or dual language signal is detected, the control circuit within IC452 transmits a signal via the I²C bus to the control microprocessor, IC117 which then selects the correct position for switch SW. A.

On multistandard receivers, switch SW. B is used to select mono audio from the System 2 sound detector (FM or AM). When switch SW. B is in position 1, the sound is muted.

MODES

Mono PAL B/G (no 54kHz subcarrier transmitted) SW. A in position 1, SW. B in position 1.

Stereo (Subcarrier with 117Hz tone). SW. A in position 2, SW. B in position 1.

Dual Language (Subcarrier with 274Hz tone). SW. A in position 1 for language I or position 3 for language II. SW. B in position 1.

Mono PAL B/G - SECAM B/G (System 2 'S' selected). Mono audio from IC450 (U2829) enters pin 9 of IC452 via resistor R643. SW. B in position 2.

Mono. B/G-D/K, B/G-I or B/G-L/L' (System 2 or 'S' selected). Audio from the FM sound detector IC114 (System D/K or I) or from the AM sound detector IC401 (System L) enters pin 9 of IC452 (resistor R463 not fitted). Switch SW. B in position 2.

FITTING AND REMOVAL

The control microprocessor IC117 can recognise the presence of the Zweiton decoder via the I²C bus and selects the correct control mode automatically.

Delete resistors R254, R255 and fit a STEREO jungle module that has IC002 (TDA2545). The mono FM sound detector IC114 (U829) is not required for single standard B/G receivers as IC450 performs the same function.

ALIGNMENT

Equipment required:

TV pattern generator with Zweiton encoder
Oscilloscope Dual beam with differential input or 'invert' and 'sum' mode.
Audio distortion meter (optional)
Ceramic alignment tool 0·8 x 1·3mm

IMPORTANT: With dual standard receivers, ensure that system 1 (P) is selected when tuning. Stereo decoding is not possible in system 2 (S) mode.

5.5MHZ detector

Tune to a system B/G MONO signal (5·5MHz sound carrier modulated with 1kHz tone).

Connect the oscilloscope (and distortion meter) to the MONO test point (IC452 pin 8 or negative pin of C462).

Adjust coil L451 for maximum undistorted amplitude of the detected audio signal.

5·742MHz detector

Tune to a B/G ZWEITON stereo or dual language signal that has the right (R) channel or language II modulated with a 1kHz or 3kHz tone. The left (L) or language I channel should not be modulated, to reduce the chance of aligning L452 to the wrong sound carrier.

Connect the oscilloscope (and distortion meter) to the 2R/II testpoint (IC452 pin 7 or the negative pin of C461).

Adjust L452 for maximum undistorted amplitude of the detected audio signal.

Stereo Balance

Tune to a B/G ZWEITON stereo signal where both channels are modulated with a 1kHz or 3kHz tone. Connect the Y1 input of the oscilloscope to the left (L) channel output (pin 11 of module or C467) and the Y2 input to the right (R) channel output (pin 12 or C468).

Select the 'channel invert' and 'sum/add' modes or differential modes on the oscilloscope to display the difference between left and right channels.

Adjust the preset potentiometer VR450 for channel balance (minimum amplitude)

Note: If a distortion meter was not used to align the detector coils L451/452, some residual harmonics may remain after adjusting VR450. The coils L451 and L452 can be re-adjusted slightly to eliminate the harmonics.

PAL I (Africa) carrier frequencies are 6·0MHz (Mono), 6·242MHz (2R)

VOLTAGES

Voltages in [ ] are measured with no signals

IC450

Pin 1 ..... 3·3V
Pin 2 ..... 3·3V
Pin 3 ..... Ground
Pin 4 ..... 5·3V/AF-Mono
Pin 5 ..... 0·4V/AF-2R
Pin 6 ..... 11·8V
Pin 7 ..... 3·3V
Pin 8 ..... 3·3V
Pin 9 ..... 2V
Pin 10 ..... 2V
Pin 11 ..... 2V/5·742MHz 20mVpp
Pin 12 ..... Ground
Pin 13 ..... 0V
Pin 14 ..... 2V/5·5MHz 40mVpp
Pin 15 ..... 2V
Pin 16 ..... 2V

IC452

Pin 1 ..... 0V [5V/840kHz spike]
Pin 2 ..... I^2C
Pin 3 ..... I^2C
Pin 4 ..... Oscillator stops
Pin 5 ..... Ground
Pin 6 ..... 0V
Pin 7 ..... 3·2V/Mono AF 200mVpp
Pin 8 ..... 3·2V/AF-2R 100mVpp
Pin 9 ..... 5·3V/AF-EXT Mono 150mVpp
Pin 10 ..... 0V
Pin 11 ..... 3·2V/AF-L 400mVpp [AF-Mono]
Pin 12 ..... 3·2V/AF-R 400mVpp [AF-Mono]
Pin 13 ..... 3·2V/AF-L [AF Mono]
Pin 14 ..... 3·2V/AF-12 [AF Mono]
Pin 15 ..... 11·8V Vcc
Pin 16 ..... Ground
Pin 17 ..... 3·2V
Pin 18 ..... 0V
Pin 19 ..... 0·2V
Pin 20 ..... 0V

FAULT GUIDE

No sound, LED or OSD shows stereo
Check XL451, IC452.

Interference or other channel audible on dual language
Check alignment of L451, L452 and VR450.

Poor separation on stereo
Check alignment of VR450.

Section 12 - System L/L' Converter

DESCRIPTION

Systems L and L' use positive video modulation and AM sound. VHF1 signals are transmitted with the sound carrier frequency below the vision carrier.

The converter module comprises of an AM sound IF and detector, a mixer to invert VHF band 1 signals and switching circuits.

SOUND IF

The TDA2543 AM demodulator circuit (IC401) incorporates a 3-stage IF amplifier with AGC, a synchronous AM detector and an audio switch. The internal de-emphasis circuit is not used.

As intercarrier sound techniques cannot be used with AM sound systems, the IF amplifier must operate at the sound IF frequency. The SAW filter SF400 only allows the sound carrier at 32·4MHz to pass.

The output of the synchronous detector at pin 14 has both DC and AC (audio) components. The DC component is used for AGC control (pin 15) after being filtered by C401 and R401. The audio signal passes through C422 to the audio switch at pin 11.

The audio source switch is controlled by pin 5. If pin 5 is high then the switch accepts external audio from the mono FM detector (pin 8). When pin 5 is low, the switch accepts AM audio from pin 11.

CARRIER CONVERTER

The TDA5030A circuit (IC402) incorporates a balanced mixer, 71·3MHz oscillator and a SAWF amplifier with low impedance output. The UHF preamplifier (pin 6) is not used. Transistor TR401 is used to switch the 71·3MHz oscillator on or off.

A bandpass filter (L404, C420, C421) is placed between the mixer and the SAWF amplifier to eliminate unwanted mixer products from entering the IF stage.

The balance of the mixer can be adjusted with potentiometer VR401 to suppress the 71·3MHz carrier.

OPERATING MODES

1. System 1 (P)

PAL or PAL/SECAM [PAL/SEC line to pin 12 low]

Switching

Diode D403 conducts, TR402 is off. The AFC polarity pin (LLAFCPOL pin 10) is high and switches the AFC detector in the jungle module to the negative slope.
TR401 is on, thus inhibiting the 71·3MHz oscillator.
TR404 is off forcing pin 5 of IC401 high for external audio input (FM)
TR403 is on, grounding the demodulator polarity pin (LLDEMPOL pin 11) and thus switching the jungle module to negative demodulation (systems B/G/H/I/D/K).

Signal path

To prevent overloading of the mixer and SAWF amplifier the IF signal must first be attenuated by 26dB with resistors R408, 410, 411.
With the 71·3MHz oscillator switched off, the IF signal passes through the mixer without any change.
After passing through the bandpass filter (L404, C420, C421) the SAWF amplifier re-amplifies the IF signal by 24-26dB.
The frequency and amplitude of the IF signal is not affected by the LL' converter module.

2. System 2 (S) - SECAM L UHF or VHF band 3

[PAL/SECAM line to pin 12 high and VHFB1D line to pin 3 low]

Switching

TR402 is off, LLAFCPOL (pin 10) high and AFC detector in negative slope.
TR401 on (71·3MHz oscillator off).
TR404 is on, grounding pin 5 of IC401 (audio switch switches to AM sound).
TR403 is off allowing pin 11 (LLDEMPOL) to rise thus switching the jungle module to positive video demodulation.

Signal path

As the 71·3MHz oscillator is switched off, the system L signal (38·9MHz vision and 32·4MHz sound carriers) pass through IC402 without change.
The 32·4MHz sound carrier passes through the audio carrier SAW filter (SF400) before being demodulated by IC401.

3. System 2 (S) - SECAM L' VHF band 1

[PAL/SECAM line to pin 12 high and VHFB1D line to pin 3 high]

Switching

As both diodes D402 and D403 are reverse biassed, transistor TR402 is on. Pin 10 (LLAFCPOL) is low so the AFC detector is in positive slope.
TR401 off (71·3MHz oscillator is on)
TR404 is on (IC401 is in AM mode).
TR403 is off forcing pin 11 (DEMPOL) high (positive video demodulation).

Signal path

The SECAM L' signal has an IF frequency of 32·4MHz (vision) and 38·9MHz (sound).
After passing through the attenuator (R408, 410, 411) it is mixed with the 71·3MHz signal from the local oscillator.
The vision carrier is converted to 38·9MHz (71·3-32·4MHz) and the sound to 32·4MHz (71·3-38·9MHz).
The new vision and sound carriers are now the same frequencies as with system L.
The unwanted products of the mixer (103·7 and 110·2MHz) are blocked by the bandpass filter L404, C420, C421.

Continued on page 3

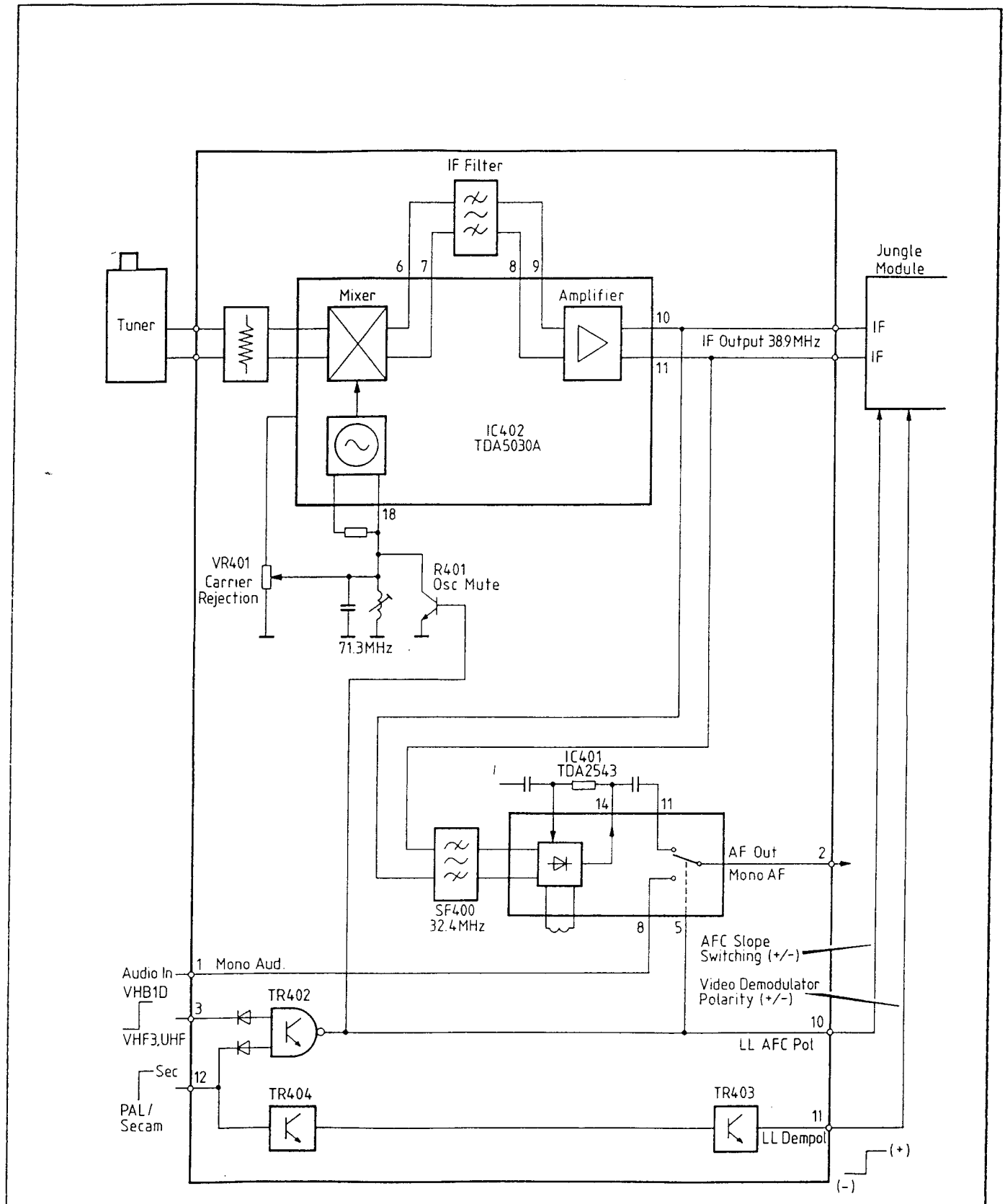


Fig. 12.1. System L/L' Decoder block diagram

FITTING AND REMOVAL

Remove links LK104, LK105 (IF) and LK109 (audio). The microprocessor should have the option links LK103, LK107 removed and LK106 fitted.

ALIGNMENT

Equipment required:

- TV pattern generator system L
- RF attenuator
- Oscilloscope - single beam 5MHz with x10 probe
- Frequency counter 100MHz
- Ceramic alignment tool (1·3 x 0·8mm)

AM SOUND DEMODULATOR

Select system 2 ('S' or SECAM) and tune to a SECAM L signal on VHF band 3 or UHF (Do not use VHF band 1). The signal should be modulated with colour bars or grey-scale and the sound carrier with a 1-3KHz tone.

Connect the oscilloscope (1V/div, 500µs/div) to the audio output (pin 2 - Mono AF)

Reduce the signal level until the picture becomes noisy.

Adjust the detector coil L402 for maximum audio output and minimum distortion.

NOTE: If the signal level is too high several false peaks may appear and the adjustment point for maximum output will also produce high distortion. The signal level should be just sufficient to produce one tuning peak.

If the detector is correctly adjusted good quality audio should be possible with signals as low as 30µV.

INVERTER OSCILLATOR

Select system 2 ('S' or SECAM) and tune to VHF band 1. Connect a frequency counter to pin 4 of IC402 (output is buffered, minimum load is 50 Ohms). Adjust L403 for a frequency of 71·3MHz (±150KHz).

CARRIER REJECTION

IMPORTANT: A true SECAM L' signal must be used for this adjustment. Many portable TV pattern generators have modulators which produce double sideband signals. The balanced mixer will superimpose the lower sideband onto the unwanted upper sideband making it impossible to achieve carrier rejection.

Use an off-air TV signal or a laboratory pattern generator with a VSB (vestigial sideband) filter.

Select system 2 ('S' or SECAM) and tune to the L' signal on VHF band 1.

Adjust the carrier rejection potentiometer VR401 to eliminate any interference on picture or buzz on sound.

VOLTAGES

IC401 (TDA2543)

Voltages measured in SECAM L/L' mode.
For PAL mode, voltages are marked [ ].

Pin 1	4·7V DC
Pin 2	4·7V
Pin 3	0·3 - 0·7V*
Pin 4	0V
Pin 5	0V [9.9V]
Pin 6	6·1V/AF 2·5Vpp
Pin 7	6·9V
Pin 8	6·9V
Pin 9	8·1V
Pin 10	8·1V
Pin 11	6·9V/AF 3Vpp
Pin 12	11·8V Vcc
Pin 13	3·9V/AF 3Vpp
Pin 14	Ground
Pin 15	3·8 - 5·6V*
Pin 16	0V
Pin 17	4·7V
Pin 18	4·7V

** Voltage varies according to signal strength*

IC402

Voltages measured with PAL or SECAM L mode.
For SECAM L', voltages are marked [ ].

Pin 1	2·4V DC
Pin 2	2·4V
Pin 3	Ground
Pin 4	6·2V
Pin 5	6·2V
Pin 6	7·8V
Pin 7	7·8V
Pin 8	3·5V
Pin 9	3·5V
Pin 10	5·4V/RF 100mVpp
Pin 11	5·4V/RF 100mVpp
Pin 12	Ground
Pin 13	1·3V [1·3V/71MHz 50mV]
Pin 14	Ground
Pin 15	11·9V Vcc
Pin 16	1·5V [1·5V/71MHz 200mVpp]
Pin 17	6·0V
Pin 18	1·9V [1·9V/71MHz 150mV]

FAULT GUIDE

Negative picture
Check video polarity switching (DEMPOL) from pin 11.

Incorrect AFC action
Check AFC polarity switching (AFC POL) from pin 10.

No sound
Check IC401, TR404.

No sound on system L' (band 1)
Check 71MHz oscillator (IC402 pin 13) and TR401.

Distorted sound
Check alignment of L402.

Patterning or interference on picture (VHFIII, UHF or PAL)
71MHz oscillator not muted - check TR402, D402, D403 short or TR401 open.

Patterning or Interference on picture (L' VHFI)
Check alignment of L403 and VR401.

Section 13 - CRT Purity and Convergence

IMPORTANT

The purity and convergence have been pre-aligned and should normally not require adjustment.

If purity or convergence is incorrect check the operation of the degaussing coil and thermistor Z100 before attempting any adjustment.

WARNING: The purity and convergence are preset by magnetised rings within the picture tube neck. Do not allow magnetised objects, external degaussing coils or magnets near the tube neck otherwise purity or convergence may be affected permanently.

ALIGNMENT

As the centre (static) convergence and purity is preset, only the peripheral (dynamic) convergence can be adjusted. Although the procedure is common to all tubes, some types have additional adjustments. Before commencing any adjustment demagnetise the tube with an external degaussing coil. Allow the receiver to operate for 15 minutes.

NOKIA

Purity and static convergence are preset and cannot be adjusted. The dynamic convergence is adjusted by means of three plastic screws at the periphery of the scan coil assembly (deflection yoke).

To release the screws, slacken the clamp screw which secures the assembly to the tube neck. Use a small screwdriver to release the catches on the two black brackets and the two violet magnet holders then slide the coil assembly backwards. The brackets and holders can then be removed from the picture tube with a sharp knife.

PHILIPS 45AX

Purity and static convergence are preset and cannot be adjusted. The dynamic convergence is adjusted by means of four sliding wedges. Convergence of the horizontal lines at the top and bottom of the screen is achieved by rotating the two metal tabs which are fitted to the yellow moulding.

VIDEOCOLOR

Small errors of purity and static convergence can be corrected with the ferrite sleeve on the tube neck. Remove the yellow adhesive tape and position the sleeve for best purity and convergence. Secure the sleeve with heat resistant adhesive tape or with cable ties. The dynamic convergence is adjusted by means of four threaded plastic studs.

Retract the convergence wedges or convergence screws and place the yoke on the tube neck. Select a green test pattern and slide the yoke backwards or forwards until a uniform green raster is obtained. Tighten the clamp screw lightly. Select a cross hatch pattern and check that the centre (static) convergence is correct. The position of the yoke may have to be moved slightly to obtain optimum purity and convergence.

Tilt the front of the deflection yoke up or down to obtain best convergence at the edge of the screen (Fig. 13.1). Place a temporary wedge at the uppermost position.

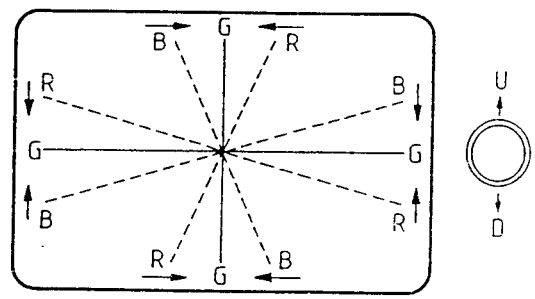


Fig. 13.1. Dynamic Convergence (edges)

Tilt the front of the yoke right or left to obtain best convergence of parallel lines (Fig. 13.2).

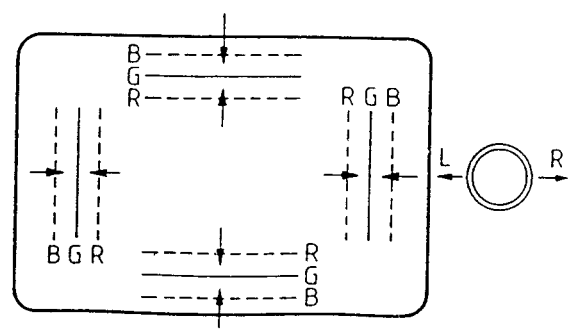


Fig. 13.2. Dynamic Convergence (parallel lines)

Keep the yoke position steady and tighten the adjusting screws or wedges just sufficiently to prevent the yoke from moving. Tighten the clamp screw on the neck firmly then tighten the convergence adjustment screws or wedges to obtain the best overall convergence.

Do not overtighten the screws otherwise the yoke will move backwards affecting purity.

Secure the ends of the screws or wedges to the glass with silicone rubber or other flexible adhesive.

CRT BASE ASSEMBLY

CRT	R614
VIDEOCOLOR	1R6
PHILIPS	3R9
NOKIA	3R9

CRT GND = CRT EARTH

RV601/2/3 ARE FITTED FOR SOME TUBES OTHERWISE LINKS ARE FITTED

C603/4/6 ARE OPTIONAL VALUE = 12p

1VDC AVERAGE STILL PICTURE

DARK CURRENT

SIGNAL GROUND

6WAY CABLE

CON600

PL600

AUDIO SWITCH MODULE

IC901 CD4066

IC902 CD4066

SECAM MODULE (OPTION)

COMPONENTS MARKED (N) ARE NOT FITTED ON SINGLE SCART VERSIONS
ADD LK106 LK118
R369-LINK, R289= LINK
TR115 B/E = LINK

GERMANY :- DELETE C225

IC111 TDA8391

IC109 TDA8453A

IC113 TDA8451A

IC108 TEA5114A

SVHS SWITCH SW100 (N)

AV1 PL106 (N)

AV2 PL105

IC001 TDA4504B

COMPOSITE VIDEO
TEXT FAST BLANKING
TEXT BLUE
TEXT GREEN
TEXT RED

PL600 Pin 4
IC111 Pin 13 (Red O/p).
IC111 Pin 26
IC111 Pin27
IC109 Pin 8
IC109 Pin 12
IC110 Pin 4
IC110 Pin15

NON TEXT

FIT : LK108

DELETE : IC110, IC104, IC105, TR134, XL101, XL100, L105, R211, R200, R201, R199, R186, R189, R190, R184, R185, R187, R196, R191
C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C172, C179, C180, C290, C174, C173, C176, C177, C178, C196, C194, C192

IC105 COUNTRY VARIATIONS
SAA5243E WESTERN EUROPE
SAA5243T TURKEY
SAA5243L HEBREW
SAA5243R RUSSIA

SYSTEM : -PAL — FIT LK103
PAL/SECAM — DELETE LK103
NO SCART SWITCHING — FIT LK111 & LK106
SCART PIN 8 SWITCHING — DELETE LK111 & LK106

IC117	C260
PCA84C640P/040	22P
UEP2805/02	22P
UEP2805/03	22P
UEP2805/04	33P

NOTE
R035/R035UB
ONLY ONE IS
FITTED AT ANY
ONE TIME

IC110 Pin11
IC110 Pin 14
IC110 Pin 17
IC110 Pin 18
IC110 Pin 22
IC110 Pin 12

RV601/2/3
ARE FITTED FOR SOME TUBES
OTHERWISE LINKS ARE FITTED

C603/4/6 ARE OPTIONAL
VALUE = 12p

DARK CURRENT

1VDC
AVERAGE STILL
PICTURE

SIGNAL
GROUND

6WAY CABLE

CON600

PL600

IC111
TDA8391

IC113
TDA8451A

IC109
TDA8453A

IC108
TEA5114A

IC001 TDA4504B

IC110 Pin 4

IC110 Pin11

IC110 Pin15

IC110 Pin 17

IC110 Pin 22

COMPOSITE VIDEO
TEXT FAST BLANKING
TEXT BLUE
TEXT GREEN
TEXT RED

AUDIO SWITCH MODULE

IC901
CD4066

IC902
CD4066

AV1 PL106

AV2 PL105

SVHS
SWITCH

COMPONENTS MARKED
(N) ARE NOT FITTED
ON SINGLE SCART
VERSIONS
ADD LK106 LK118
R369=LINK, R289= LINK
TR115 B/E =LINK

GERMANY :-
DELETE C225

PAL BG/SECAM DK :- FIT CF101, R241, L108, C296
PAL BG OR PAL I OR PAL BG/SECAM LL OR PAL BG/SECAM BG :- DELETE CF101R, 241, L108
FIT C296=LINK

NICAM OR ZWEITON MODULE
(OPTION)

IF INVERTOR MODULE
(OPTION)

NICAM/ZWEITON :- DELETE R255, R254
NICAM FIT R212
ZWEITON MULTISTD FIT LINK

IC115
TDA8425

IC114
U829B

IC116
TDA2616

TUNER
UHF 3010 UEC
UHF/VHF KHC2000

TNR100

SECAM L/L':- DELETE LK104, LK105
LK110 LK107, LK109

AUDIO SWITCH
MODULE SINGLE
SCART ONLY

SANDCASTLE

HORIZONTAL DRIVE

HORIZ SHIFT

I.F JU

IC110 Pin 4
IC110 Pin11
IC110 Pin 14
IC110 Pin15
IC110 Pin 17
IC110 Pin 18
IC110 Pin 22
IC110 Pin 12
IC109 TDA8453A
IC113 TDA8451A
IC108 TEA5114A
IC114 U829B
IC001 TDA4504B
IC002 TDA2545A
IC117 PCA84C640B
I.F JUNGLE MODULE
IF INVERTOR MODULE (OPTION)
TEXT PERSONALITY MODULE
KEYBOARD CONNECTOR
COMPOSITE VIDEO
TEXT FAST BLANKING
TEXT BLUE
TEXT GREEN
TEXT RED
HORIZONTAL DRIVE
SANDCASTLE
HORIZ SHIFT
HORIZ FREQ
TV/AV
PRESET CONTRAST
TUNER AGC
L001 VIDEO DET
BRIGHTNESS
SATURATION
CONTRAST
MUTECON
BAND 1
BAND 3
AFC CONTROL
UHF
TEXT CLOCK
SDA
SCL
5VSBY
INFRA-RED INPUT
STANDBY LED
STEREO LED
OSD RED
OSD GREEN
OSD BLUE
OSD BLANKING
AV1/AV2
AV2 PL105
PAL/SEC
LL DEMOD POL
LL AFC POL
VHF B1 SWITCH
PAL BG/SECAM DK :- FIT CF101, R241, L108, C296
AM LL OR PAL BG/SECAM BG :- DELETE CF101R, 241, L108
FIT C296=LINK
SECAM L/L' :- DELETE LK104, LK105 LK110 LK107, LK109
TUNER UHF 3010 UEC UHF/VHF KHC2000
TNR100
TX102 See Table for options
PL303 LINK
PL950
PL304 to PL401 on LL CONVERTOR
NOTE R035/R035UB ONLY ONE IS FITTED AT ANY ONE TIME

IC110 Pin11

IC110 Pin 14

IC110 Pin 17

IC110 Pin 18

IC110 Pin 22

IC110 Pin 12

IC117 PCA84C640B

IC112 PCF8582A

KM6264A

TEXT PERSONALITY MODULE

IC002 TDA2545A

I.F JUNGLE MODULE

PL950 KEYBOARD CONNECTOR

PL304 to PL401 on LL CONVERTOR

TEXT CLOCK

SYSTEM :-PAL — FIT LK103
PAL/SECAM — DELETE LK103
NO SCART SWITCHING — FIT LK111 & LK106
SCART PIN 8 SWITCHING — DELETE LK111 & LK106

IC117	C260
PCA84C640P/040	22P
UEP2805/02	22P
UEP2805/03	22P
UEP2805/04	33P

NOTE R035/R035UB ONLY ONE IS FITTED AT ANY ONE TIME

CRT :- NOKIA R148=120R R175=10K
PHILIPS R148=390R R175=10K
VIDEOCOLOR R148=220R R175=9K1

TX102 See Table for options

SANDCASTLE

TV/AV

NICAM OR ZWEITON MODULE (OPTION)

IF INPUT

STEREO LED

TO PL950 pin12

SDA

SCL

RIGHT OUT

LEFT OUT

MONO INPUT

MUTE

PAL BG/SECAM DK :- FIT CF101, R241, L108, C295
PAL BG OR PAL I OR PAL BG/SECAM LL OR PAL BG/SECAM BG :- DELETE CF101R, 241, L108
FIT C296=LINK

IF INVERTOR MODULE (OPTION)

PAL/SEC

LL DEMOD POL

LL AFC POL

VHF B1 SWITCH

AUDIO SWITCH MODULE SINGLE SCART ONLY

NICAM/ZWEITON :- DELETE R255, R254
NICAM FIT R212
ZWEITON MULTISTD FIT LINK

LINK

IC115
TDA8425

IC114
U829B

IC116
TDA2616

TUNER
UHF 3010 UEC
UHF/VHF KHC2000

SECAM L/L' :- DELETE LK104, LK105
LK110 LK107, LK109

TUNING CONTROL VOLTAGE 0 - 30V

UHF : DELETE : TR110, TR112, TR109, TR114, TR108, TR113, R243
R244, R240, R238, R258, R264, R237, R259, R265
FIT : LINKS 100, 101, 102

VERSION 1 & 2 AUDIO OUTPUT STAGE

ITEMS MARKED (M) FITTED TO VER 1 ONLY

IC116
TDA2009A

AUDIO MUTE MODULE VERSION 2 ONLY

MUTECON

340V NOMINAL

15.5VDC

IC100
TDA8380

IC101
TCTD1101

TX100

TR100
SGSIF344

MAINS FILTER MODULE

MAINS SWITCH

MAINS INPUT

DEGAUSS COIL

IC100 Pin 18

IC100 Pin 10

Collector TR100

SYSTEM	
PAL I NICAM	
PAL I IRELAND	
PAL B/G STEREO	
PAL B/G SEC LL	
PAL B/G D/K	

PAL BG/SECAM DK :- FIT CF101, R241, L108, C296
PAL BG OR PAL I OR PAL BG/SECAM LL OR PAL BG/SECAM BG :- DELETE CF101R, 241, L108
FIT C296=LINK

IF INVERTOR MODULE (OPTION)

I.F JUNGLE MODULE

IC002 TDA2545A

IC114 U829B

IC116 TDA2616

IC100 TDAB380

IC101 TCTD1101

IC118 7805

IC102 7812

TUNER UHF 3010 UEC
UHF/VHF KHC2000

SECAM L/L':- DELETE LK104, LK105 LK110 LK107, LK109

TUNING CONTROL VOLTAGE 0 - 30V

UHF : DELETE : TR110, TR112, TR109, TR114, TR108, TR113, R243 R244, R240, R238, R258, R264, R237, R259, R265
FIT : LINKS 100, 101, 102

TX102 See Table for options

TO CRT BASE

TO HORIZ SCAN

TO AUDIO OUTPUT STAGE

JUNCTION D116 & D

I.F JUNGLE MODULE VARIATIONS (*)

SYSTEM	SF001	CF001	L005	L006	R033	R002	C004
PAL I NICAM	J3250	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL I IRELAND	J3251	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL B/G STEREO	63264	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL B/G SEC LL	63264	OMIT	LINK	22uH	27K	51R	18p
PAL B/G D/K	K3258	TP85.5M	10uh	6u8	OMIT	75R	18p

IC100 Pin 18
IC100 Pin 10
Collector TR100
IC107 Pin 1
IC107 Pin 2
IC106 Pin 1
IC106 Pin 5

I.F JUNGLE MODULE

IC002 TDA2545A

Pin5
Pin24
Pin19
Pin23
Pin20
Pin3/16

PL950 KEYBOARD CONNECTOR

STANDBY LED
STEREO LED

OSD RED
OSD GREEN
OSD BLUE
OSD BLANKING

SANDCASTLE

TX102 See Table for options

TO CRT BASE
TO HORIZ SCAN
TO VERT SCAN

TX102 OPTIONS

TYPE	LINK
Orega M86/M88	LK113 LK115
Nokia M12 xx	LK114 LK116

CRT :-

NOKIA	R148=120R R175=10K
PHILIPS	R148=390R R175=10K
VIDEOCOLOR	R148=220R R175=9K1

IC103 7805
IC102 7812
IC118 7805
IC107 TDA8145
IC106 TDA3654

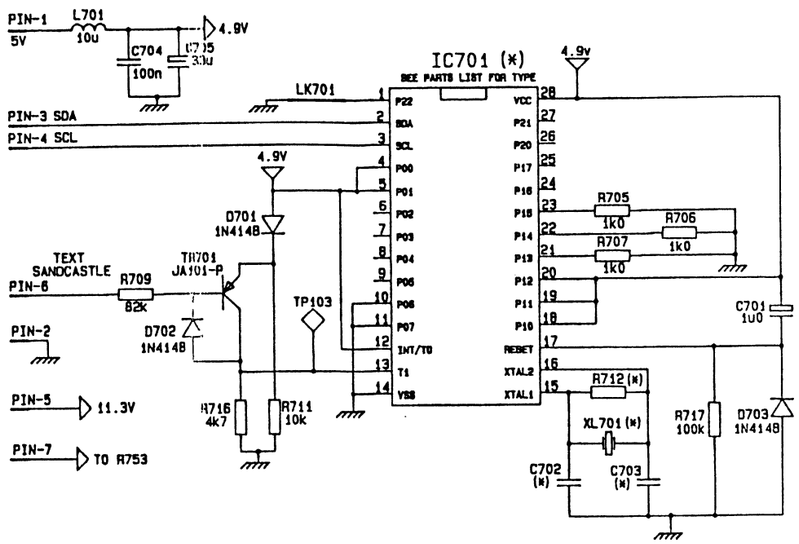
JUNCTION D116 & D117

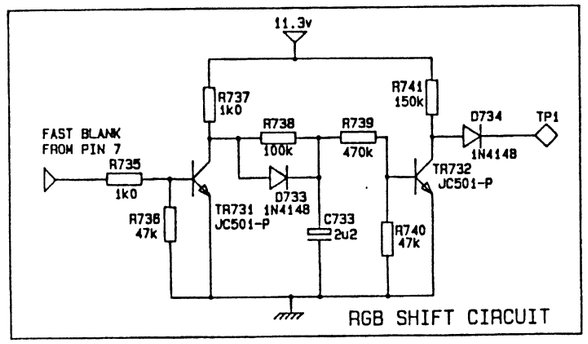
IC107 Pin 1
IC107 Pin 2
IC106 Pin 1
IC106 Pin 5

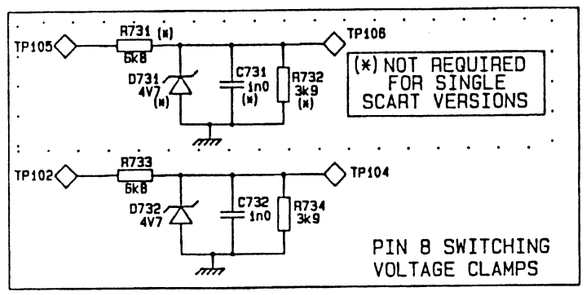
I.F JUNGLE MODULE VARIATIONS (M)

SYSTEM	SF001	CF001	L005	L006	R033	R002	C004
PAL I NICAM	J3250	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL I IRELAND	J3251	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL B/G STEREO	G3264	OMIT	LINK	22uH	OMIT	75R	OMIT
PAL B/G SEC LL	G3264	OMIT	LINK	22uH	27K	51R	18p
PAL B/G D/K	K3258	TP35.5W	10uh	6u8	OMIT	75R	18p

MAIN SCHEMATIC
NEI CE25/CE28
MK3



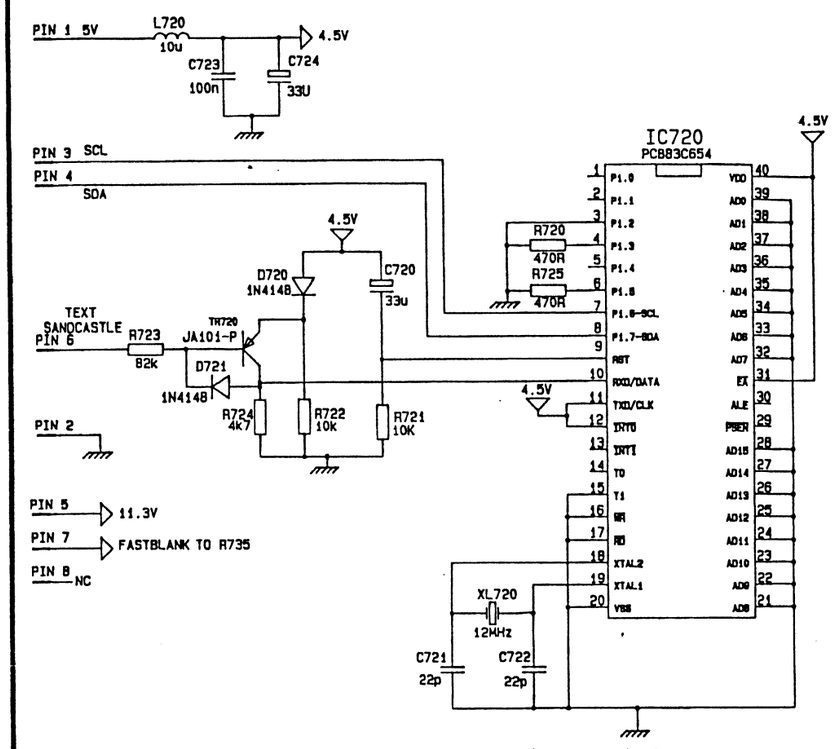


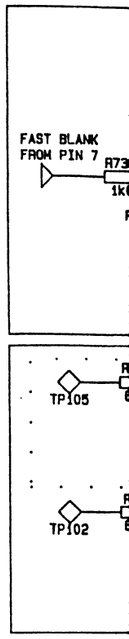


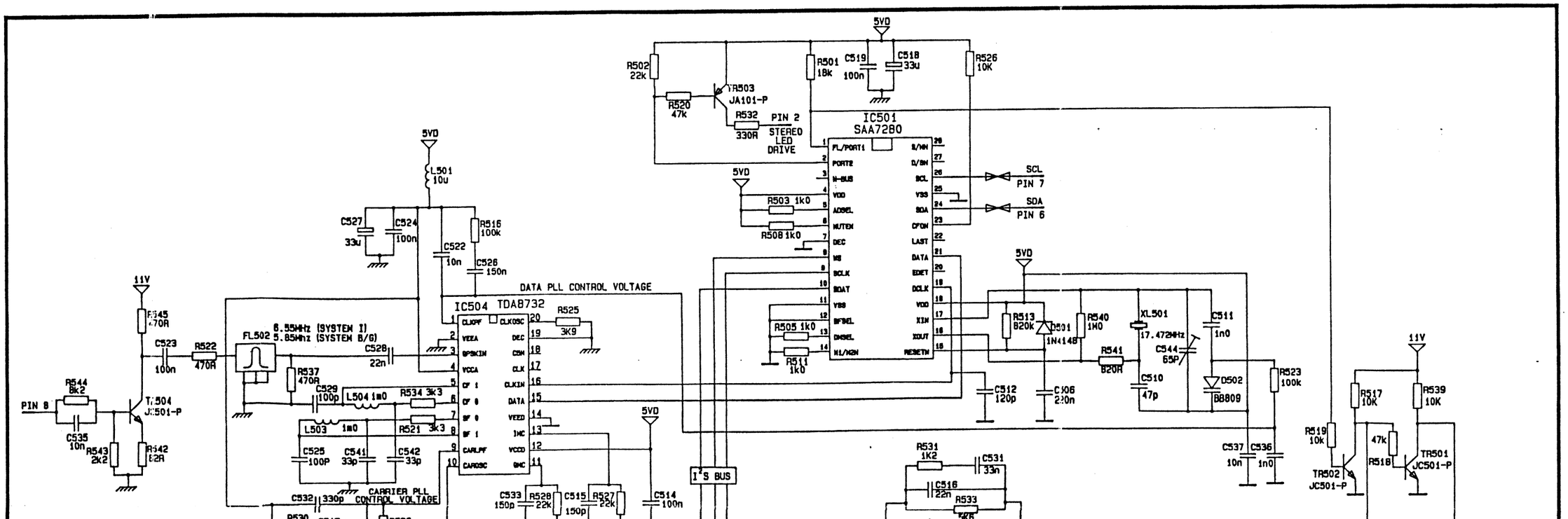
IC107 OPTIONS					
IC107	XL701	R712	C702	C703	LK701
CTV971	6Mhz	1M0	22pf	22pf	FIT
CTV972	9.83Mhz	OMIT	OMIT	OMIT	#
CTV974	9.83Mhz	OMIT	OMIT	OMIT	FIT

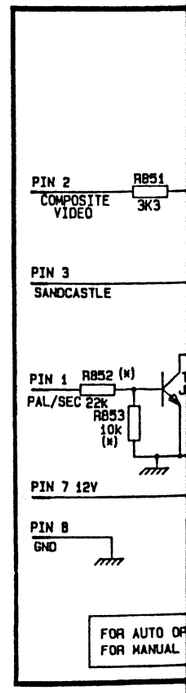
Omit for IC105 SAA5243 P/E
Fit for IC105 SAA5243 P/H

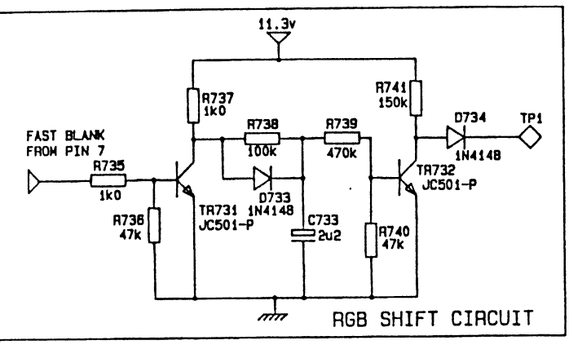
FAST TEXT MODULE
(Part No 46-031-311)

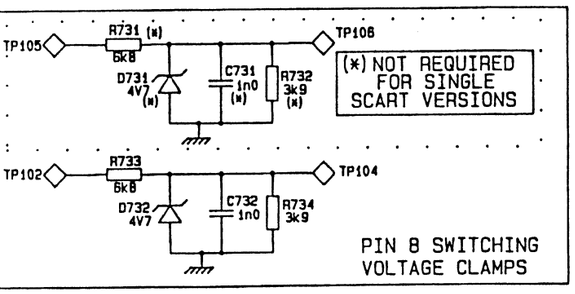




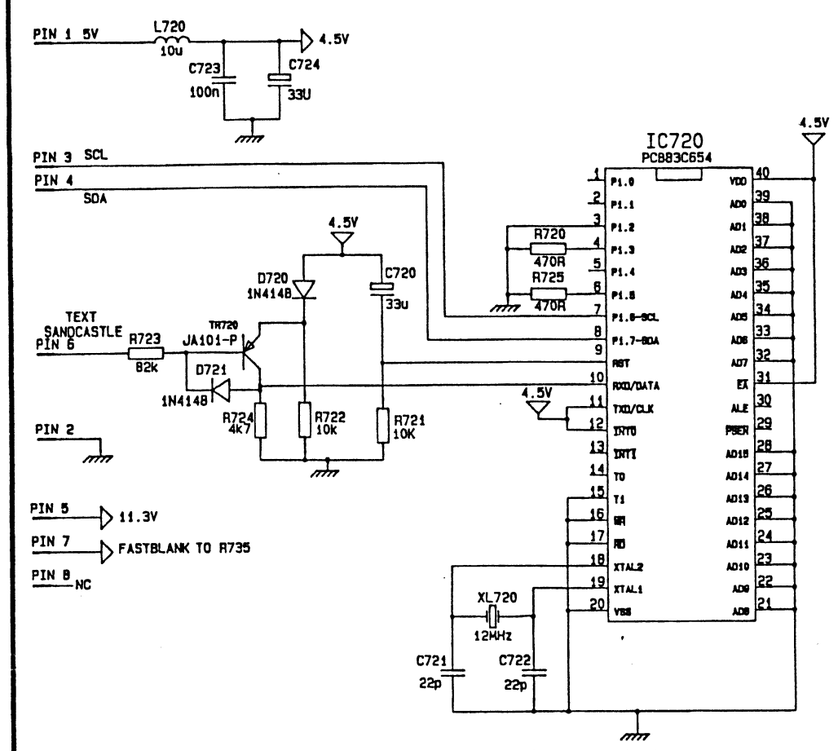


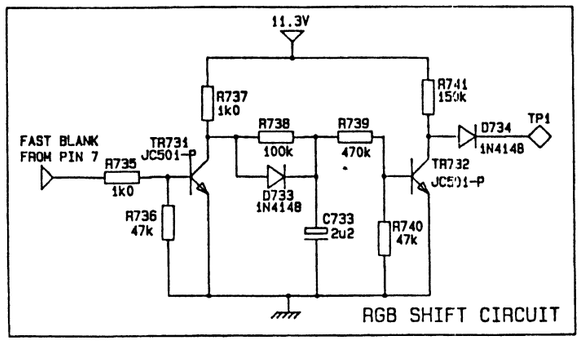


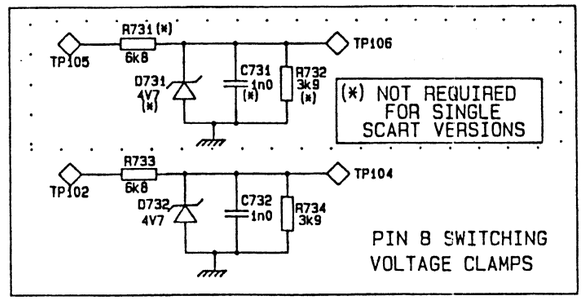




FAST TEXT MODULE
(Part No 46-031-311)





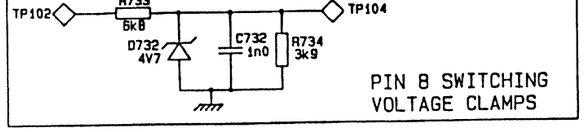


TOPS TEXT MODULE
(Part No 46-031-301)

SECAM MODULE
(Part No 46-031-501)

IC107 OPTIONS					
IC107	XL701	R712	C702	C703	LK701
CTV971	6Mhz	1M0	22pf	22pf	FIT
CTV972	9.83Mhz	OMIT	OMIT	OMIT	#
CTV974	9.83Mhz	OMIT	OMIT	OMIT	FIT

Omit for IC105 SAA5243 P/E
Fit for IC105 SAA5243 P/H



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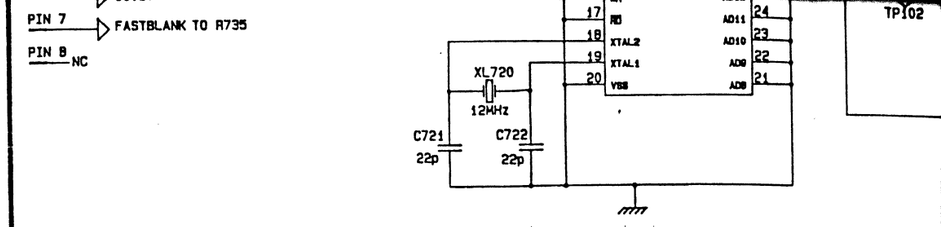
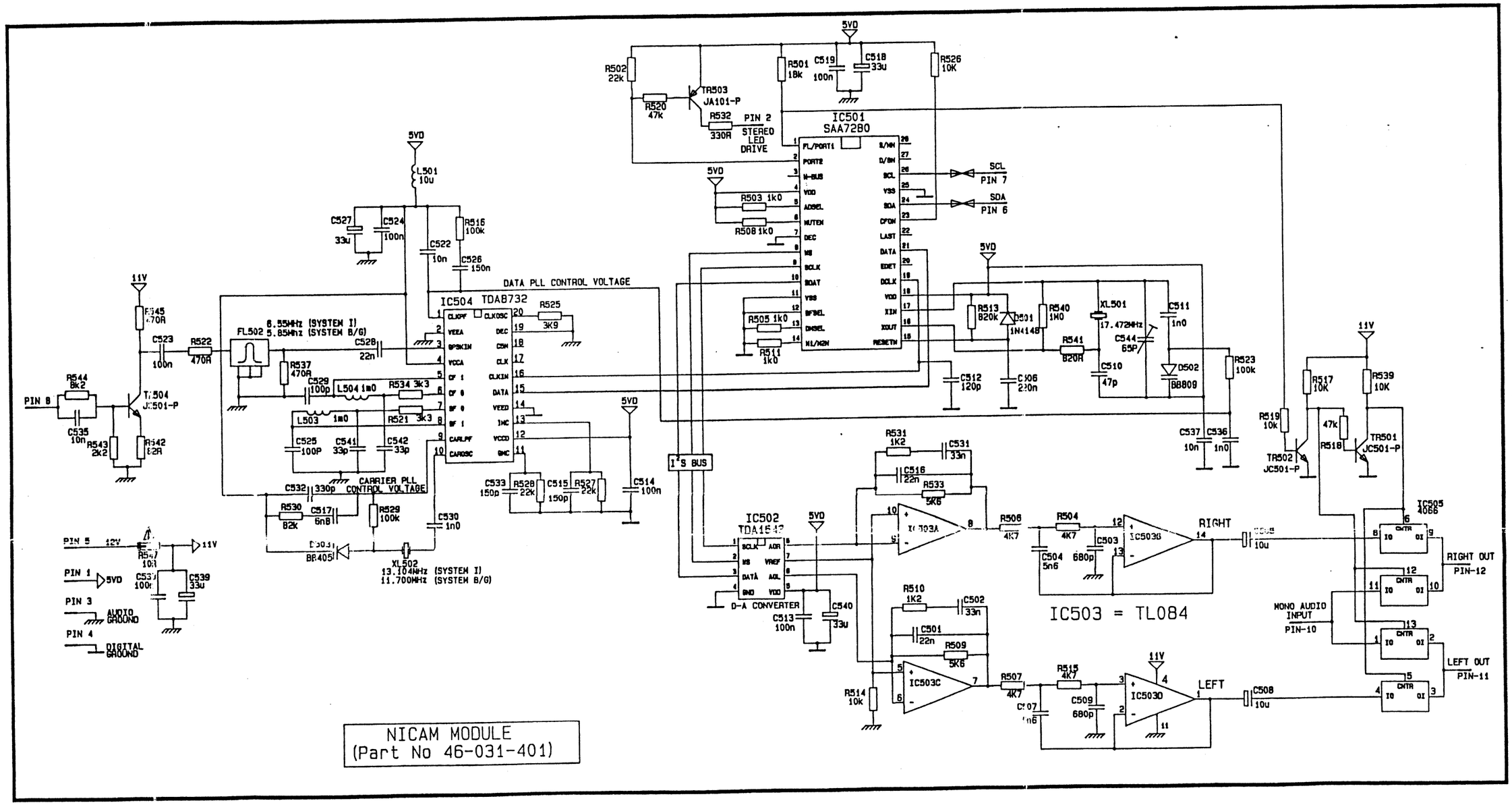
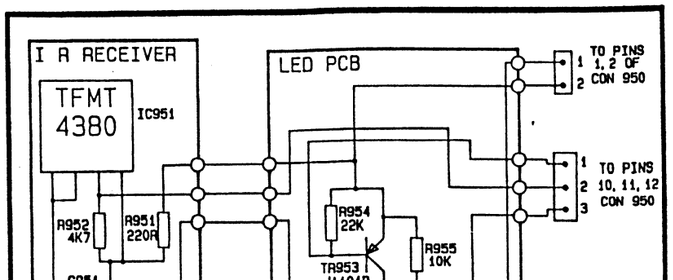
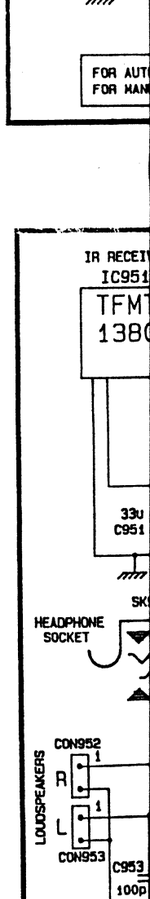
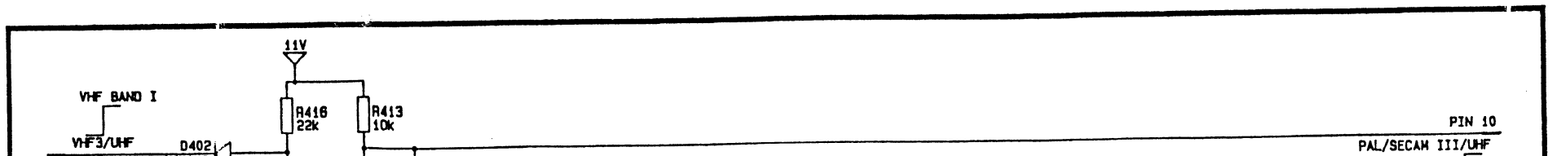


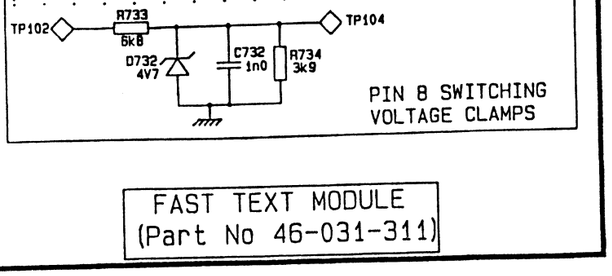


NICAM MODULE
(Part No 46-031-401)

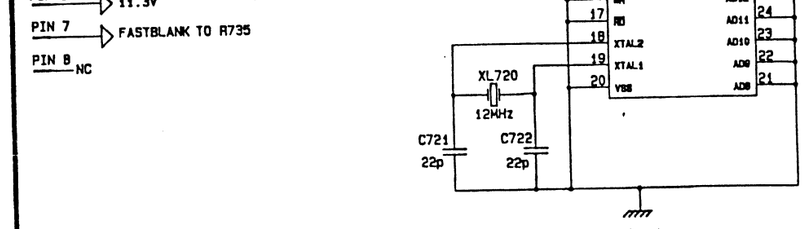


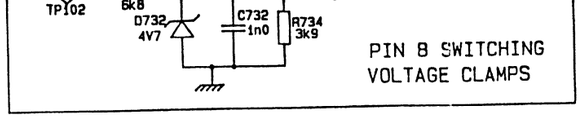




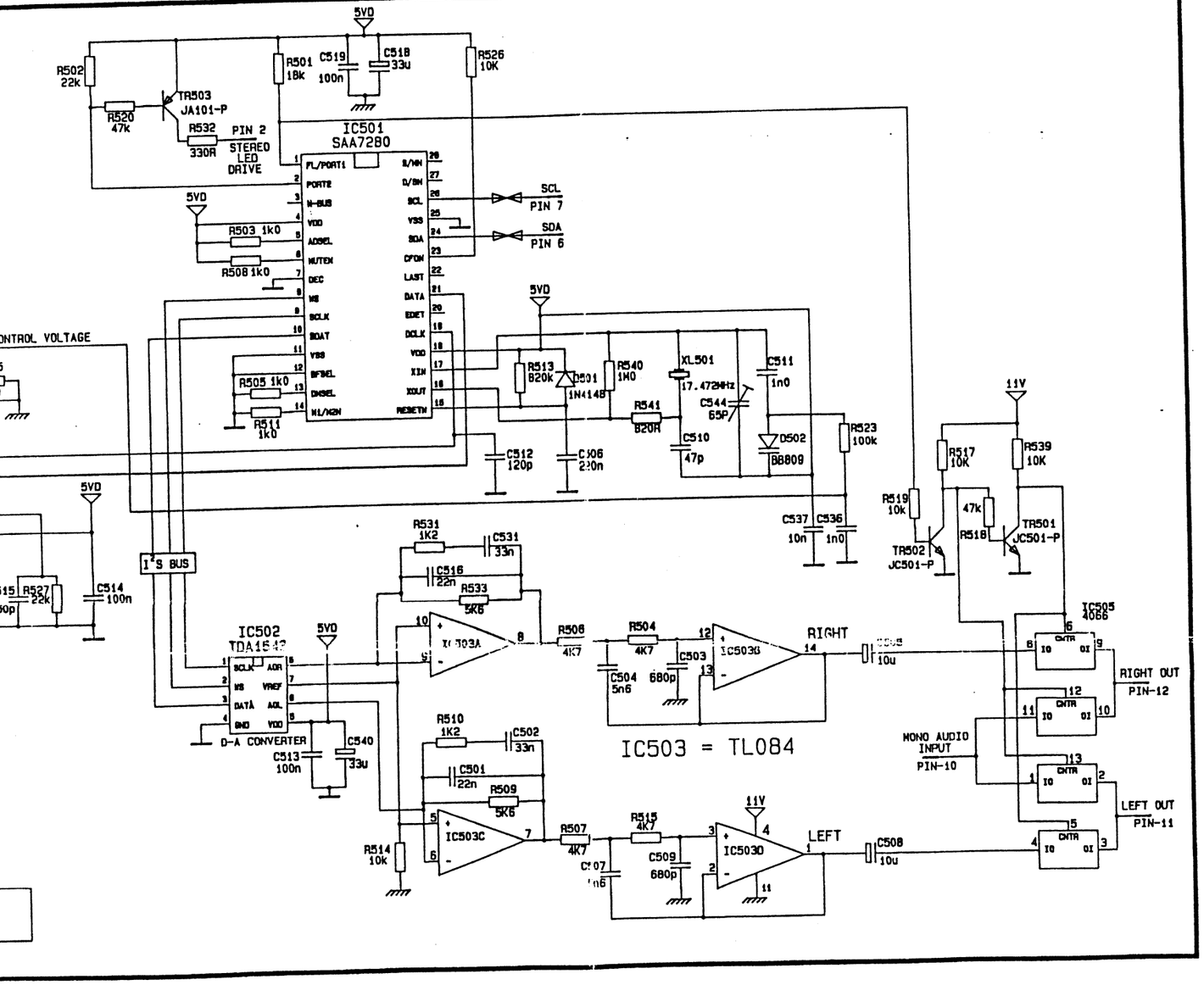


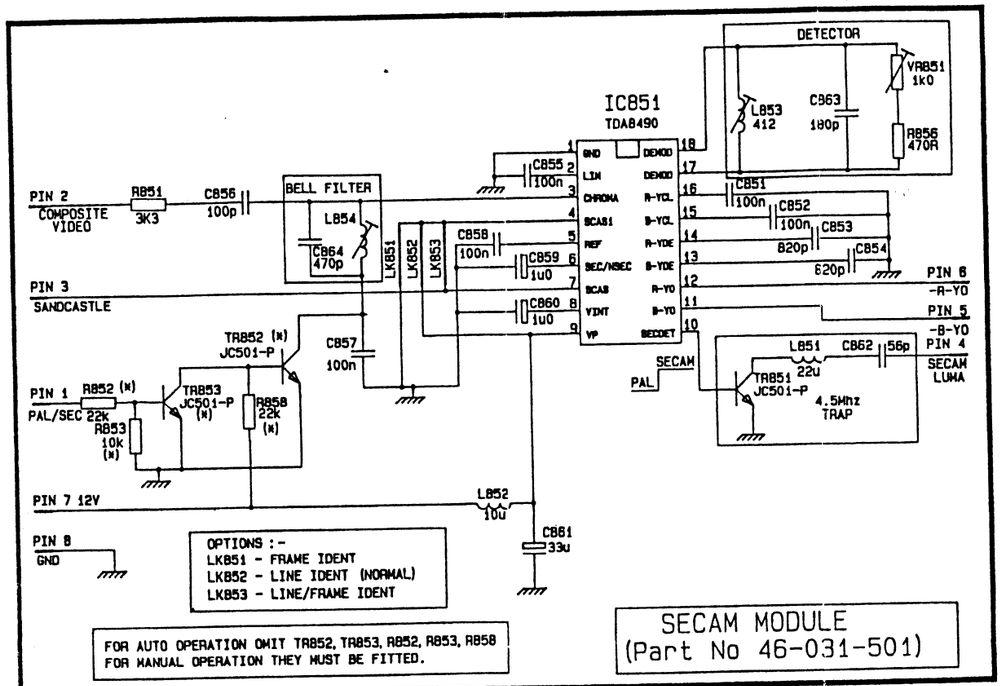
FAST TEXT MODULE
(Part No 46-031-311)



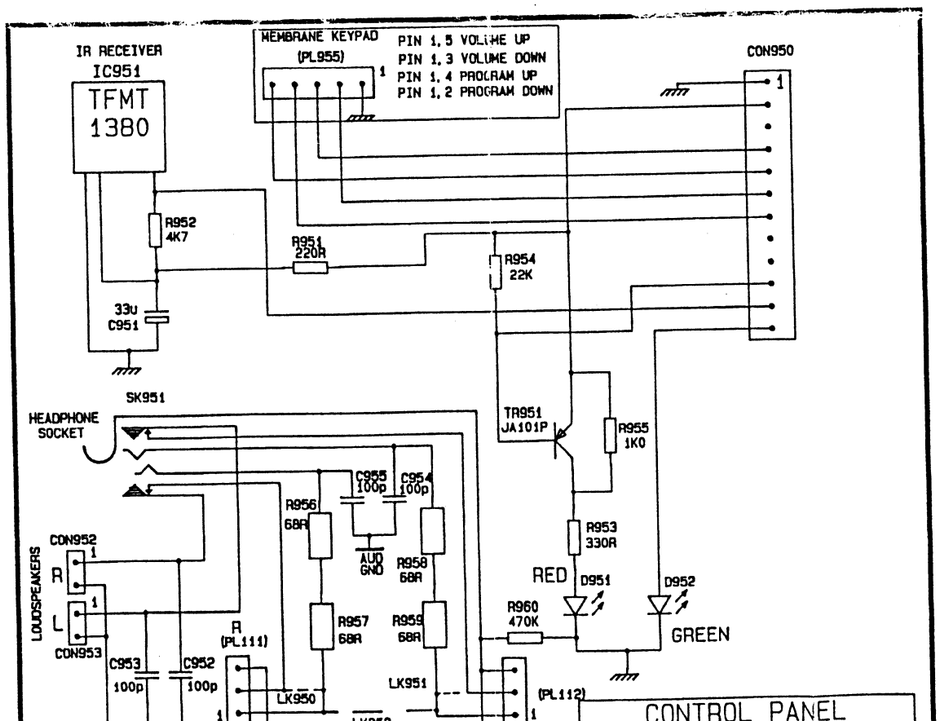


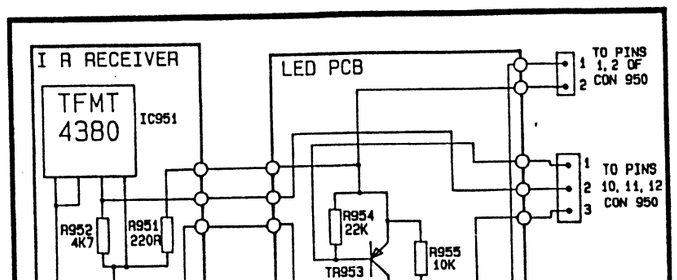
TOPS TEXT MODULE
(Part No 46-031-301)

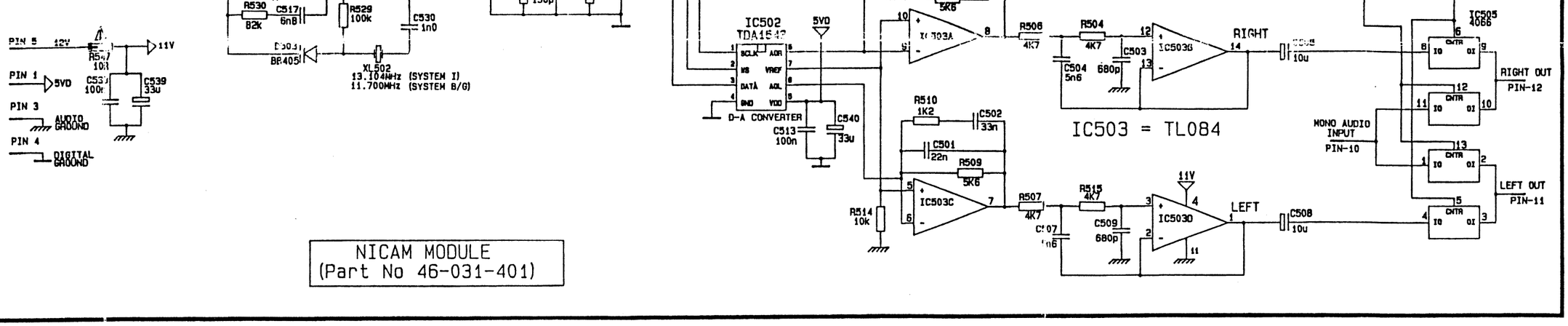


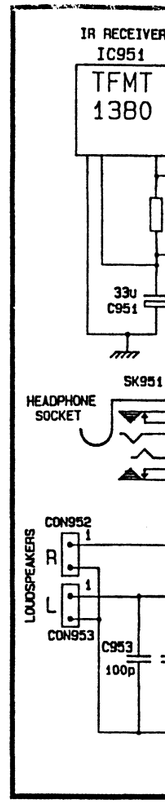


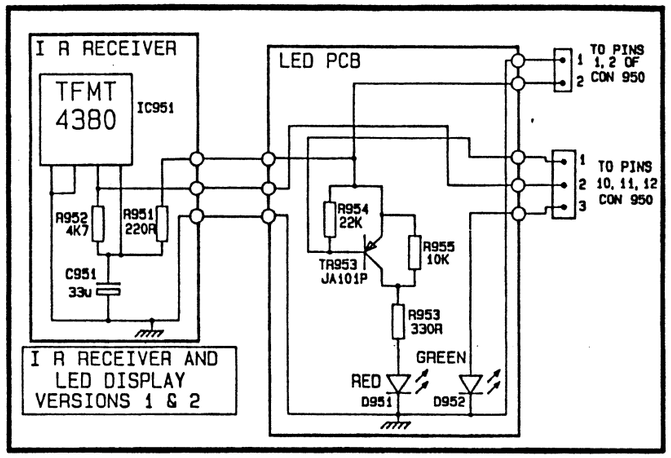
SECAM MODULE
(Part No 46-031-501)

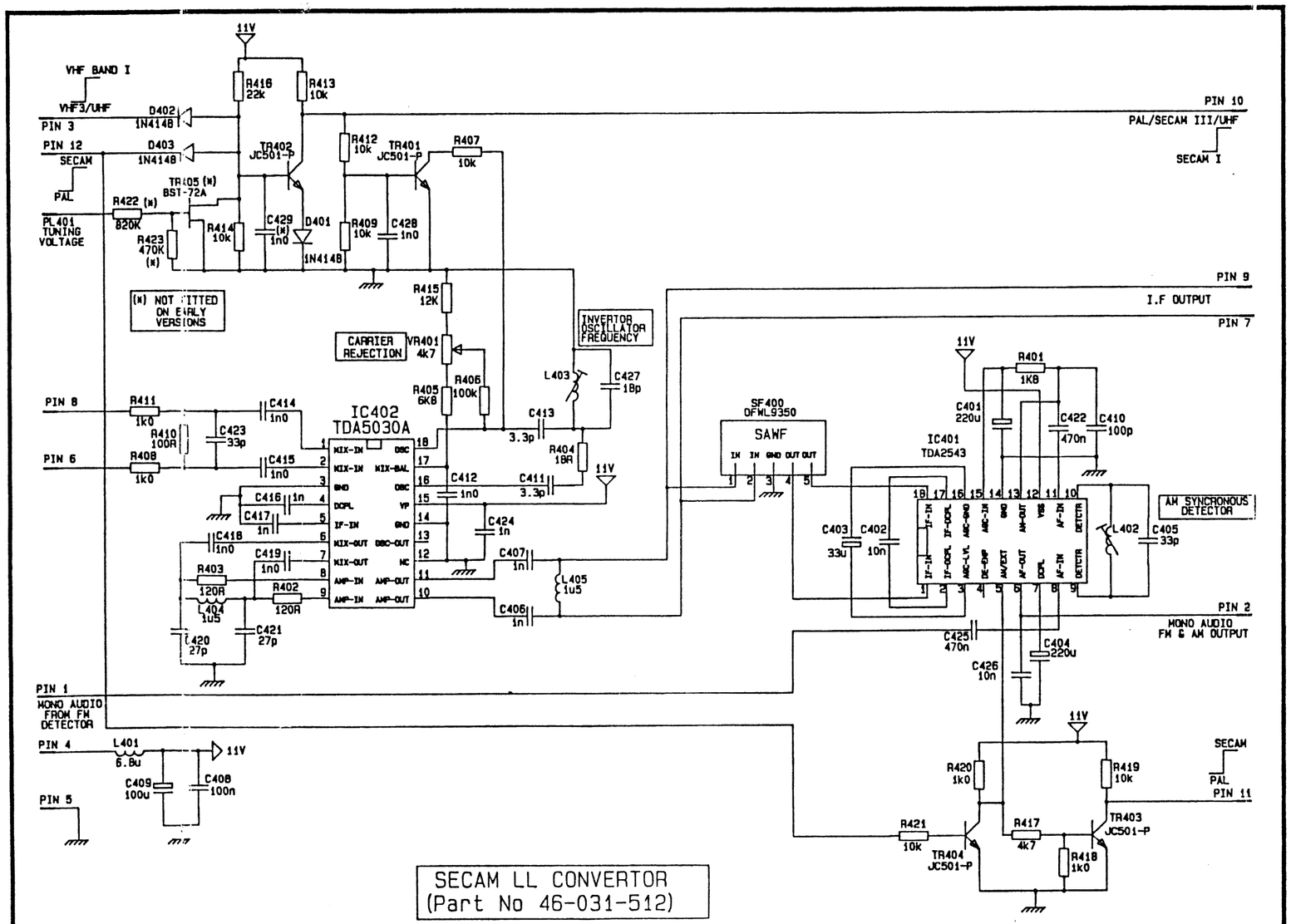


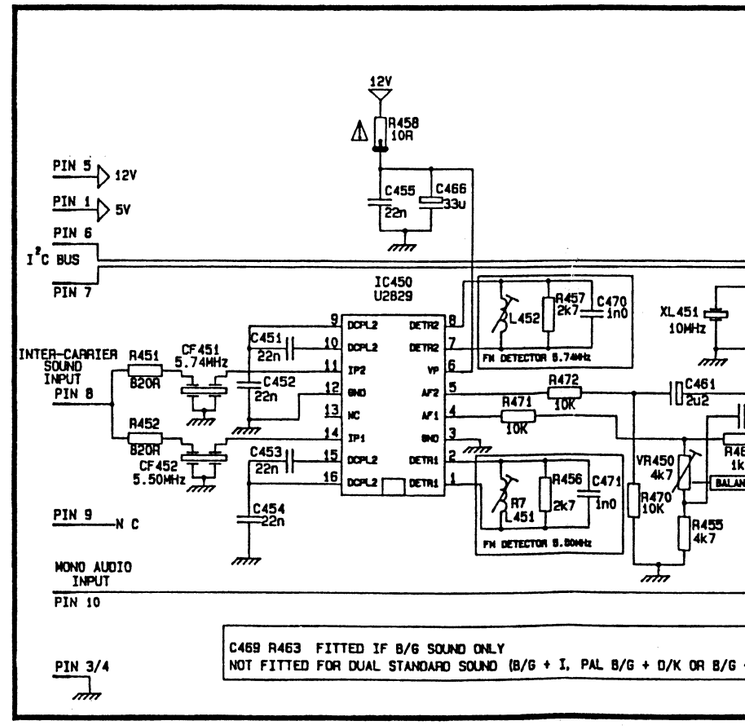



PIN 5 12V
PIN 1 5VD
PIN 3 AUDIO GROUND
PIN 4 DIGITAL GROUND
R547 10R
C537 100n
C539 33u
11V
R530 82k
C517 6n8
R529 100k
C530 1n0
D501 BB405B
XL502 13.104MHz (SYSTEM I) 11.700MHz (SYSTEM B/G)
IC502 TDA1543
BCLK ADR
WS VREF
DATA AOL
GND VDD
D-A CONVERTER
5VD
C513 100n
C540 33u
R510 1K2
C502 33n
C501 22n
R509 5K6
R514 10k
IC503A
IC503C
R506 4K7
R507 4K7
R504 4K7
R515 4K7
C504 5n6
C503 680p
C509 680p
C507 1n6
IC5038
IC5030
RIGHT
LEFT
C508 10u
C505 10u
IC503 = TL084
IC505 4066
CNTR
RIGHT OUT PIN-12
LEFT OUT PIN-11
MONO AUDIO INPUT PIN-10
NICAM MODULE
(Part No 46-031-401)


IR RECEIVER
IC951
TFMT 1380
33u C951
SK951
HEADPHONE SOCKET
LOUDSPEAKERS
CON952
R
L
CON953
C953 100p


I R RECEIVER
TFMT 4380
IC951
R952 4K7
R951 220R
C951 33u
LED PCB
TO PINS 1, 2 OF CON 950
TO PINS 10, 11, 12 CON 950
R954 22K
TR953 JA101P
R955 10K
R953 330R
GREEN
RED
D951
D952
I R RECEIVER AND LED DISPLAY VERSIONS 1 & 2


11V
VHF BAND I
VHF3/UHF
PIN 3
D402 1N4148
PIN 12
SECAM
D403 1N4148
PAL
PL401 TUNING VOLTAGE
R422 (x) 820K
R423 470K (x)
TR405 (x) BST-72A
R414 10k
C429 (x) 1n0
D401 1N4148
R409 10k
C428 1n0
R416 22k
R413 10k
TR402 JC501-P
R412 10k
TR401 JC501-P
R407 10k
PIN 10
PAL/SECAM III/UHF
SECAM I
PIN 9
I.F OUTPUT
PIN 7
(x) NOT FITTED ON EARLY VERSIONS
R415 12K
CARRIER REJECTION
VR401 4k7
INVERTOR OSCILLATOR FREQUENCY
R405 6K8
R406 100k
L403
C427 18p
C413 3.3p
R404 18R
C412 1n0
C411 3.3p
C424 1n
C407 1n
C406 1n
L405 1u5
C404 1u5
C420 27p
C421 27p
R403 120R
R402 120R
C416 1n
C417 1n
C418 1n0
C419 1n0
C414 1n0
C415 1n0
C423 33p
R410 100R
R411 1k0
R408 1k0
PIN 8
PIN 6
IC402 TDA5030A
MIX-IN
MIX-IN
GND
DCPL
IF-IN
MIX-OUT
MIX-OUT
AMP-IN
AMP-IN
DSC
MIX-BAL
DSC
VP
GND
DSC-OUT
NC
AMP-OUT
AMP-OUT
SF400 OFWL9350
SAWF
IN IN GND OUT OUT
IC401 TDA2543
C401 220u
C422 470n
C410 100p
R401 1K8
C403 33u
C402 10n
L402
C405 33p
AM SYNCRONOUS DETECTOR
PIN 2
MONO AUDIO FM & AM OUTPUT
C425 470n
C426 10n
C404 220u
PIN 1
MONO AUDIO FROM FM DETECTOR
PIN 4
PIN 5
L401 6.8u
C409 100u
C408 100n
R420 1k0
R419 10k
R421 10k
R417 4k7
R418 1k0
TR404 JC501-P
TR403 JC501-P
SECAM
PAL
PIN 11
SECAM LL CONVERTOR
(Part No 46-031-512)


12V
R458 10R
PIN 5 12V
PIN 1 5V
PIN 6 I²C BUS
PIN 7
C455 22n
C466 33u
IC450 U2829
DCPL2
IP2
GND
NC
IF1
DCPL2
DCPL2
DETR2
VP
AF2
AF1
GND
DETR1
DETR1
INTER-CARRIER SOUND INPUT PIN 8
R451 820R
CF451 5.74MHz
CF452 5.50MHz
R452 820R
C451 22n
C452 22n
C453 22n
C454 22n
L452
R457 2k7
C470 1n0
FM DETECTOR 5.74MHz
XL451 10MHz
R472 10K
R471 10K
C461 2u2
VR450 4k7
R456
C471
R7
L451 2k7
1n0
FM DETECTOR 5.50MHz
R470 10K
R455 4k7
PIN 9 N C
MONO AUDIO INPUT
PIN 10
C469 R463 FITTED IF B/G SOUND ONLY
NOT FITTED FOR DUAL STANDARD SOUND (B/G + I, PAL B/G + D/K OR B/G
PIN 3/4

IC502
TDA1543
D-A CONVERTER
5V0
C513 100n
C540 33u
R506 4K7
R504 4K7
C504 5n6
C503 680p
IC503A
IC503B
RIGHT
C508 10u
IC505 4066
RIGHT OUT PIN-12
MONO AUDIO INPUT PIN-10
R510 1K2
C502 33n
C501 22n
R509 5K6
IC503C
IC503D
LEFT
11V
R514 10k
R507 4K7
R515 4K7
C509 680p
LEFT OUT PIN-11
IC503 = TL084

I R RECEIVER
TFMT 4380
IC951
LED PCB
TO PINS 1, 2 OF CON 950
TO PINS 10, 11, 12 CON 950
R952 4K7
R951 220R
C951 33u
R954 22K
TR953 JA101P
R955 10K
R953 330R
GREEN
RED
D951
D952
I R RECEIVER AND LED DISPLAY VERSIONS 1 & 2

IR RECEIVER
IC951
TFMT 1380
MEMBRANE KEYPAD
(PL955)
PIN 1, 5 VOLUME UP
PIN 1, 3 VOLUME DOWN
PIN 1, 4 PROGRAM UP
PIN 1, 2 PROGRAM DOWN
CON950
R952 4K7
33u C951
R951 220R
R954 22K
SK951
HEADPHONE SOCKET
TR951 JA101P
R955 1K0
C955 100p
C954 100p
R956 68R
R958 68R
R957 68R
R959 68R
AUD GND
CON952
CON953
LOUDSPEAKERS
R953 330R
RED
D951
D952
R960 470K
GREEN
C953 100p
C952 100p
R (PL111)
CON954
LK950
LK952
LK951
(PL112)
CON951
CONTROL PANEL VERSION 3 (Part No 46-031-202)

PIN 10
PAL/SECAM III/UHF
SECAM I
PIN 9
I.F OUTPUT
PIN 7
11V
R401 1KB
SF400 OFWL9350
SAWF
IN IN GND OUT OUT
C401 220u
C422 470n
C410 100p
IC401 TDA2543
AM SYNCRONOUS DETECTOR
C403 33u
C402 10n
L402
C405 33p
PIN 2
MONO AUDIO FM & AM OUTPUT
C425 470n
C404 220u
C426 10n
11V
SECAM
PAL
PIN 11
R420 1k0
R419 10k
R421 10k
R417 4k7
TR403 JC501-P
TR404 JC501-P
R418 1k0

12V
R458 10R
C455 22n
C466 33u
12V
R459 10R
C460 33u
C459 22n
PIN 5 12V
PIN 1 5V
PIN 6 I²C BUS
PIN 7
IC450 U2829
IC452 TDA8417
5V
R460 22k
TR450 JA101-P
R461 5k6
R462 330R
PIN 2 TO STEREO LED
C458 220n
R454 10k
INTER-CARRIER SOUND INPUT PIN 8
R451 820R
CF451 5.74MHz
C451 22n
C452 22n
R452 820R
CF452 5.50MHz
C453 22n
C454 22n
L452
R457 2k7
C470 in0
FM DETECTOR 5.74MHz
XL451 10MHz
R472 10K
R471 10K
C461 2u2
C462 2u2
R463 1k0
BALANCE
VR450 4k7
R470 10K
R456 2k7
C471 in0
R7 L451
FM DETECTOR 5.50MHz
R455 4k7
C469 47n
C468 2u2
C467 2u2
PIN 11 LEFT AUDIO OUT
PIN 12 RIGHT
PIN 9 N C
MONO AUDIO INPUT
PIN 10
PIN 3/4
C469 R463 FITTED IF B/G SOUND ONLY
NOT FITTED FOR DUAL STANDARD SOUND (B/G + I, PAL B/G + D/K OR B/G +L)
ZWEITON DECODER (Part No 46-031-411)

Section 15 – Parts Lists

IMPORTANT: Components identified with the safety symbol have safety related characteristics and must only be replaced with types approved by the manufacturer. Use of unauthorised replacements could endanger safety.

PARTS LISTS ABBREVIATIONS

Resistors

CF – Carbon film
FR – Fusible
MO – Metal oxide
MF – Metal film
MG – Metal glaze
SR – Safety
WW – Wire wound

Presets

H – Horizontal mounting
V – Vertical mounting

Capacitors

CA – Ceramic axial
CD – Ceramic disc
ELC – Electrolytic
MKP – Metalised polypropylene
MKT–Metalised polyester
FKP–Polypropylene foil
MKT-P– Mixed dielectric
KS – Polystyrene

Tolerances

F = ± 1%
G = ± 2%
H = ± 2·5%
J = ± 5%
K = ± 10%
M = ± 20%

Temperature coefficient of Low K (Class 1) ceramic capacitors: C(NPO) = Zero, P(N150) = -150 x10^{-6}/deg C
SL = +350 to -1000 x10^{-6}/deg C

Temperature characteristic of Medium K (Class II) ceramic capacitors: B(Y5R) = ±10%, F(Y5V) = -22+82% temperature range = -30+85 deg C

Temperature characteristic of High K (Class III) ceramic capacitors: X(Y5R) = +/-15%, Y(Y5S) = ±22% temperature range = -30+85 deg C

Part No.	Description	Position
11-010-066	IC HEF 4066BP	IC505, IC901, IC902
11-105-002	IC KM6264A SRAM	IC104
11-200-013	IC L7805AC	IC103, IC118
11-200-018	IC L7812AC	IC102
11-200-200 R5	Diode 33V ZTK33B	D113
11-205-015	⚠ IC Opto TCDT 1101	IC101
11-210-001	IC ILO74CN	IC503
11-304-003	IC TDA8380/N1	IC100
11-304-100	IC TDA 5030	IC402
11-304-200	IC TDA4504B/N1	IC001
11-304-256	IC TDA8391/N1	IC111
11-304-257	IC TDA8451A/N1	IC113
11-304-258	IC TDA8453/NI	IC109
11-304-259	IC TDA8490/N4	IC851
11-304-353	IC TDA3654/N3	IC106
11-304-355	IC TDA8145	IC107
11-304-450	IC TEA5101A	IC600
11-304-452	IC TEA5114	IC108
11-304-600	IC SAA7280P	IC501
11-304-601	IC TDA1543/N2	IC502
11-304-602	IC TDA 2543	IC401
11-304-604	IC TDA8417/V1	IC452
11-304-605	IC TDA8425/V7	IC115
11-304-606	IC TDA8732/C1	IC504
11-304-607	IC U829B	IC114
11-304-608	IC U2829	IC450
11-304-609	IC TDA2545A/V1	IC002
11-304-653	IC TDA2009A	IC116
11-304-712	INFRA RED PREAMP TFM	IC951
11-304-801	IC SAA5231/V7	IC110
11-304-802	IC SAA5243P/E/M3	IC105
11-304-808	IC SAA5243P/T	IC105
11-304-809	IC MAB8461P/W172	IC701
11-304-812	IC PCF84C81P/049	IC701
11-304-813	IC PCF84C81P/075	IC701
11-304-814	IC PCB83C654P/AC013	IC720
11-304-819	IC CE25 MICRO V.2K	IC117
11-304-901	IC 85C82/P	IC112
13-001-001 R	TRNJC501-P	See Appendix A
13-001-004 R	TRN 2N3904	TR126
13-002-001 R	TRN JA101-P (KTC3198)	See Appendix A
13-006-002	TRN BC337	TR105, TR127
13-008-003	TRN BU508AF	TR128
13-008-005	TRN SGSIF344	TR100
13-009-001	TRN BD234	TR130
15-002-006 R5	DIODE BB405	D503
15-002-011 R5	DIODE BB809	D502
15-004-028 R	DIODE BY255	D100, D101, D102, D103
15-004-204 R	DIODE BA157	D106, D120, D121
15-004-243 R	DIODE BY297	D122
15-004-246 R	DIODE BY299	D105, D110, D117
15-004-252 R	DIODE BY396	D107
15-004-253 R	DIODE BY397	D108
15-005-001	DIODE BY228	D116
15-021-462 R5	DIODE ZPD 6V2 (BZX79)	D112
15-021-451 R5	DIODE ZPD 5V1 (BZX85)	D104
15-022-510 R5	DIODE ZPD 10V (BZX79)	D604
15-022-533 R5	DIODE ZPD 33V (BZX79)	D124
16-003-002	LED (GREEN)	D952
16-003-003	LED (RED)	D951
18-125-001	⚠ CPT 25"	
18-128-001	⚠ CPT 28"	
21-022-513 R5	CFR 13K G 1/8W	R109
21-043-620 R5	CFR*200K J 1/4W	R152
22-022-543 R5	MFR 43K G 1/8W	R019
22-022-624 R5	MFR 240K G 1/8W	R112
22-023/491 R5	MFR 9K1 2% 1/4W	R175
22-042-713 R5	MFR 1M3 J 1/8W	R027

Part No.	Description	Position
22-043-033 R5	MFR 0R33 J 1/4W	R147
22-801-647	MGR 470K J VR37	⚠ R801
22-801-747 R5	MGR 4M7 0.5W J VR37	⚠ R118
22-804-610 R5	MGR 100K 5% 1W VR68	⚠ R601
23-025-547	MORF 47K 2% 1W	R604, R605, R617
23-044-427	MOR 2K7 1/2W	R602, R603, R606
23-045-110	MOR 1R 5% 1W	R123
23-045-356	MORF 560R 5% 1W	R146, R362
23-045-382	MORF 820R 5% 1W	R363
23-048-212	MOR 12R 5% 3W RW3	R103
23-050-256	WRC-P 56K J 5W	R101
23-067-356	MORF 560R 5% 2W	R144
24-005-412	WWR 1K2 5% 10W (KV)	R328
24-013 110	WWR 1R K 5W	⚠ R802, R803
24-022-127	WWR 2R7 K 2W	R116
24-102-339	WWR 390 J 4W	⚠ R319
26-024-022	FR.0.22R 2% 1/2W	⚠ R102
26-042-247	FR 47R 5% 1/8W	⚠ R001, R012
26-043-022	FR 0.22R 5% 1/4W	⚠ R138, R139
26-043-110	FR 1R 5% 1/4W	⚠ R140, R256, R257, R371
26-043-122	FR 2R2 J 1/3W	⚠ R366
26-043-147	FR 4R7 5% 1/4W	⚠ R030
26-043-168	FR 6R8 5% 1/4W	⚠ R174
26-043-210	FR 10R 5% 1/4W	⚠ See Appendix A
26-043-227	FR 27R 5% 1/4W	⚠ R154, R353
26-043-247	FR 47R 5% 1/4W	⚠ R229
26-043-310	FR 100R 5% 1/4W	⚠ R625
26-045-010	FR 0.1R J 1W	⚠ R133
26-045-118	FR IR8 5% 1W	⚠ R614
26-045-143	FR 4R3 5% 1W	⚠ R614
26-045-410	FR 1K 5% 1W	⚠ R135
28-001-001	DUAL PTC THERMISTOR	Z100
31-201-333	CC330PF IKV 10%	C115, C117, C118
31-201-347	CC 470PF 1KV 10%	C106
31-201-410	CC 1NF 1KV 10%	C101, C102, C103
31-216-422	CC 2N2F 2K6V IN	C610
31-220-447	SAFETY CAPACITOR	⚠ C124
31-220-447	CC 4N7 TN13FZA727	⚠ C124
32-039-527	C-MKT 27NF 400V 5% MKP10	⚠ C132
32-024-268-A	C-MKT 680PF 100V 1% FKP2	⚠ C111
34-013-412	C-MKT 1N2F 2000V 5%	⚠ C134
34-013-418	C-MKT IN8F 2000V (376)	⚠ C105
34-013-491	C-MKT 9N1F 1600V 5%	⚠ C131
34-030-682	C-MKT 820NF 160V 5%	⚠ C135
36-001-647	C-MKT 470N 10% X2CLA	⚠ C801
36-001-710	C-MKT 1UF 10% X2 CLA	⚠ C802
36-002-610	C-MKT 100NF X2 CLASS	⚠ C104
37-011-310	EC 100UF 160V 20% GA	C114, C129
37-013-210 A	EC 10UF 250V 20% GA	C140, C601
37-201 322	EC 220UF 400V 20% HM	⚠ C100
38-003-122	EC TRIMMER CAP 22PF	C290
38-003-265	CC TRIMMER 65PF 808	C544
41-011-368	CHOKE 680UH 10% FL11	L101
41-099-001	FEED COIL 10mH 400mA	⚠ L103
41-102-112 A5	CHOKE 1.2uH 10% LALO2	L115
41-102-115 A5	CHOKE 1.5uH	L404, L405
41-102-122 A5	CHOKE 2.2uH 10% LALO	L126, L128
41-102-168	CHOKE 6u8H 10% LAL02	⚠ L002
41-102-168 A5	CHOKE 6u8H 10% LALO2	See Appendix A
41-102-210 A5	CHOKE 10uH 10% LALO2	L110, L111, L501, L720, L852
41-102-215 A5	CHOKE 15uH LALO2	L105
41-102-222 A5	CHOKE 22UH 5% LAL02	L006, L007, L851
41-103-210 A5	CHOKE 10uH 10% LALO3	L701
41-103-410 A5	CHOKE 1mH	L503, L504
41-103-118	CHOKE 1.8uH 10% (LALO4	L100
41-104-182	CHOKE 8.2uH 10% LALO4	L117

Part No.	Description	Position
41-104-210	CHOKE 10uH 10% LALO4	L623, L106, L109, L127, L621, L622
41-199-001	COIL BRIDGE 1.7mH 0.9A	L116
41-204-002	COIL 412	L853
41-204-006	COIL 564	L854
41-204-008	COIL KSZ-73 (E)	L402
41-204-010	COIL KZA-73 (R7)	L107, L451, L452
41-204-011	COIL 185	L403
41-214-004	LINEARITY COIL	⚠ L104
41-320-002	DST	⚠ TX102
41-321-002	SMPS	⚠ TX100
41-329-003	LINEDRIVER	TX101
41-332-003	LINE FILTER 49mH 1.6A	⚠ L802
41-338-006	DEGAUSSING COIL 25"	⚠
41-338-007	DEGAUSSING COIL 28"	⚠
42-001-002	CRYSTAL 4.43 MHz	XL102
42-001-004	CRYSTAL 10.00 MHz	XL451
42-001-005	CRYSTAL 13.875 MHz	XL101
42-001-006	CRYSTAL 6.00 MHz	XL100, XL701
42-001-007	CRYSTAL 9.83 MHz	XL103
42-001-008	CRYSTAL 17.472 MHz	XL501
42-001-009	CRYSTAL 13.104 MHz	XL502
42-001-011	CRYSTAL 11.70 MHz	XL502
42-001-012	CRYSTAL 12.0 MHz	XL720
42-005-004	SAW FILTER OFWJ3250	SF001
42-005-005	SAW FILTER OFWL9350	SF400
42-005-007	SAW FILTER OFWG3255	SF001
42-005-009	SAW FILTER OFWJ3251	SF001
42-005-	SAW FILTER OFWK3253	SF001
42-007-002	CERAMIC FILTER 5.5MH	CF100
42-007-003	CERAMIC FILTER 6.0MH	CF100
42-007-005	CERAMIC FILTER 5.74M	CF451
42-007-006	CERAMIC FILTER 5.5MH	CF452
42-007-012	SAW FILTER OFWJ3264	SF001
42-010-001	FILTER	L502
42-010-002	FILTER	L502
43-007-320	PL111 PL112 2 WAY	PL111, PL112
43-016-022	CONNECTOR 2 PIN	PL100, PL103, PL801
43-016-042	CONNECTOR 2 PIN	PL101, PL102

Part No.	Description	Position
43-021-022	CONN. HOUSING 2 PIN	PL102
43-021-042	CONN. HOUSING 2 PIN	PL100, PL103, PL801
43-021-042	CONN. HOUSING 2 PIN	PL801
43-038-008	F PINS	
43-198-003	SCART SOCKET	PL105, PL106
43-198-013	SPEAKER SOCKET	PL107, PL108
43-202-202	CRT SOCKET	⚠ SK600
44-001-004	MAINS SWITCH	⚠
44-002-004	SWITCH 9S-VHS) + BUT	SW100
44-059-002	RUBBER KEYPAD	
44-100-416	FUSE 1.6A A.SURG	⚠ F801
46-005-003	PREAMP LED PCB LD	
46-007-001	MAINS CABLE (PAL I)	⚠
46-007-003	CABLE + NOISE SUPP. FIL	⚠
46-017-101	SPEAKER LD + SKPL11	PL111
46-017-102	SPEAKER LD + SKPL11	PL112
46-017-112	FILTER PCB-SW LD + SK	PL801
46-017-113	SW CHASSIS LD + SK PL1	PL100
46-031-?31 P	PCB CONTROL	
48-001-006	SPEAKER	
49-003-001	TUNER (UHF)	TNR100
49-003-004	TUNER (UHF/VHF)	TNR100
49-900-009	REMOTE H/S NON TEXT	
49-900-010	REMOTE H/S T/FTXT	
49-900-011	REMOTE H/S FTXT + N/Z	
92-001-013	CHASSIS SUPPORT BRKT	
92-006-007	SPRING ON/OFF BUTTON	
93-020-015	AUDIO PCB SUPPORT	
93-480-004	FILTER BOARD COVER	
93-900-001	CTV CABINET 25" (ALL	
93-900-002	CTV CABINET 28" (ALL	

⚠ **SAFETY COMPONENT**

APPENDIX A

Part No.	Description	Position
13-001-001	TRN JC501-P	TR001, TR002, TR104, TR106, TR111, TR112, TR113, TR114, TR115, TR116, TR117, TR118, TR119, TR120, TR122, TR123, TR124, TR132, TR133, TR134, TR401, TR402, TR403, TR404, TR501, TR502, TR504, TR731, TR732, TR851, TR901, TR902, TR903, TR904
13-002-001-3	TRN JA101-P	TR102, TR103, TR108, TR109, TR110, TR121, TR450, TR503, TR701, TR720
26-043-210	FR 10R 5% 1/4W	R547, R137, R337, R338, R251, R324, R458, R324, R458, R459, R612, R911
41-102-168 A5	Choke 6u8H 10% LAL02	L002, L003, L123, L118, L119, L120, L130, L401, L121, L122

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